ST1

Single Axis Servo Driven Robot

User Manual

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SHINI®
plastics technologies

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1. Safety

Before starting up the robot for the first time, please review this manual thoroughly and familiarize yourself with the operation of the robot. Improper use may injure personnel and/or damage the robot, mold or molding machine.

1.1 Safety Regulations

- Please review this manual thoroughly and familiarize yourself with the operation of the robot, before starting up the robot for the first time. Maintenance should be performed by qualified personnel only.

- The ST1 series robot is designed for injection molding machine (IMM) ONLY.

- Any modification or change to the original design of the robot is forbidden.

- Any improper installation and operation may result in injury to personnel and/or damage to equipments.

- Please contact the manufacturer or local vender immediately if there is any problem with robot when operate it.

- Please note that our robot must be cooperated with other safety device (i.e. safety door) in order to operate in normal condition.

- Ensure all installations are met with safety requirements before operating.

- Without the written consent of the manufacturer, any damage or lost caused by the modification or use beyond the user manual, the

manufacturer will not have any responsibility.

1.2 Safety Concerns

- The maintenance, repair, etc, must be executed by professionally trained personnel.
- Any unrelated personnel should keep away from robot working area while it is operating. All electrical wiring must be completed by professionals, and in accordance with design of specifications and wiring instructions.
- Use safety fence to indicate working area while installation.
- For the safety operation, the hand controller should be placed outside the robot working area.
- Ensure bolts and nuts are tightened with torque wrench while installation.
- Ensure there is no following matters in the compressive air such as phosphate-containing oil, organic solvents, sulfite gas, chlorine, acids and stale compressor oil.
- The air pressure should be kept at 6MPa ±0.1MPa while operation.
- Remove anything from the top of the robot to prevent falling due to vibration.
- Press EMERGENCY STOP button immediately when accident occurs.
- Do not modify the robot body and control box. Please contact manufacturer or vendor if any change is required.
- Turn off power supply and compressed air before maintenance and adjustment. Also set up warming signs and safety fences.
- Please use parts of SHINI if there is any replacement is required.
- Our robots meet all corresponding safety standards.
- Please read the user manual carefully as a safety guideline.
- Unauthorized personnel must inform the relative supervisor, and understand all safety rules before entering robot working area.
- Please order a new user manual from the manufacturer or vendor if the user manual is damaged.

Product owner has the responsibility to ensure the operators, maintenance staffs and relative staffs have read user manual thoroughly.

Any modifications or other applications to robot should obtain the written consent from the manufacturer, for safety purpose.

The safeguarding required for operation of the robot is not including in our standard scope of supply (except special equipment), since adaptation to specific site conditions is required. If such safeguarding is provided by you, please note that it must be installed prior to startup of the equipment in order to be included in the safety circuit of the system upon startup.

The warning marks and its meanings

No.	Marks	Meaning
1		DO Not Touch
2		Caution , Danger
3		Caution! Electric shock
4		Caution! Mechanical injury
5		Caution! High temperature

6		No Flame

1.3 Emergency Stop

The emergency stop button is located on the hand controller.

When the emergency stop button is pressed, the power is turned off. The gripper and vacuum valves and the vacuum generator are not disconnected, in order to avoid dropping parts from the gripper. In addition, the control system and the hand controller will remain under power to allow indication of error messages.

The emergency stop button can be released by turning it clockwise.

The emergency stop circuit of the robot and the injection molding machine are connected by the Euromap12 or Euromap67 interface. Therefore when the emergency stop button on the molding machine is pressed the robot will also stop and vice versa.

1.4 Transportation and Storage

During transporting the robot, working underneath the robot is forbidden.

If it is necessary to remove or reinstall the robot, please contact the agent or manufacturer for help. The manufacturer and agent do not have any responsibility for injuries or damage if the customers remove robots themselves.

1.4.1 Transportation

1. ST1-series robot is fix on a steel structure base and packaged with crate.
2. Before transporting, fasten the sliding base to prevent any collision.
3. The arms are free to slide when electric power and pneumatic supply are off. Push the arms upwards to lock them.
4. During the transporting, please keep the robot away from other objects, in order to avoid damages.
5. Should increase plastic bag out of the robot, and if necessary, pumping vacuum and put desiccant in the packing during the long-distance transportation,
6. The temperature between -25℃ to 55℃ during the transportation, for short transportation (inner 24 hours), the temperature can not higher than 70℃.

The robot you order before sending out the factory, it is confirmed in good working condition, please check whether there is any damage during carrying or transporting. Please be carefully, when dismantling of components and packaging, if the robot has found the injury, you can use the package again.

If there is any damage caused by transport, please:

1) Feedback immediately to the transportation companies and our company.
2) Claim damages to the shipping company; fill in the file requests for compensation.
3) Retain the damaged items wait for testing. Until the testing is completed, do not return the damaged items.

1.4.2 Transportation after Unpacking

1. After taking apart the package, first removed the supporting plate, so that the arm rotated 90 degrees, and the vertical with beams (see the picture). To do as the following:

1) Release 6 fixed screws on the supporting board, remove the packing support plate.
2) Rotating beams and arm slowly, so that the arm and the beam was

vertical.

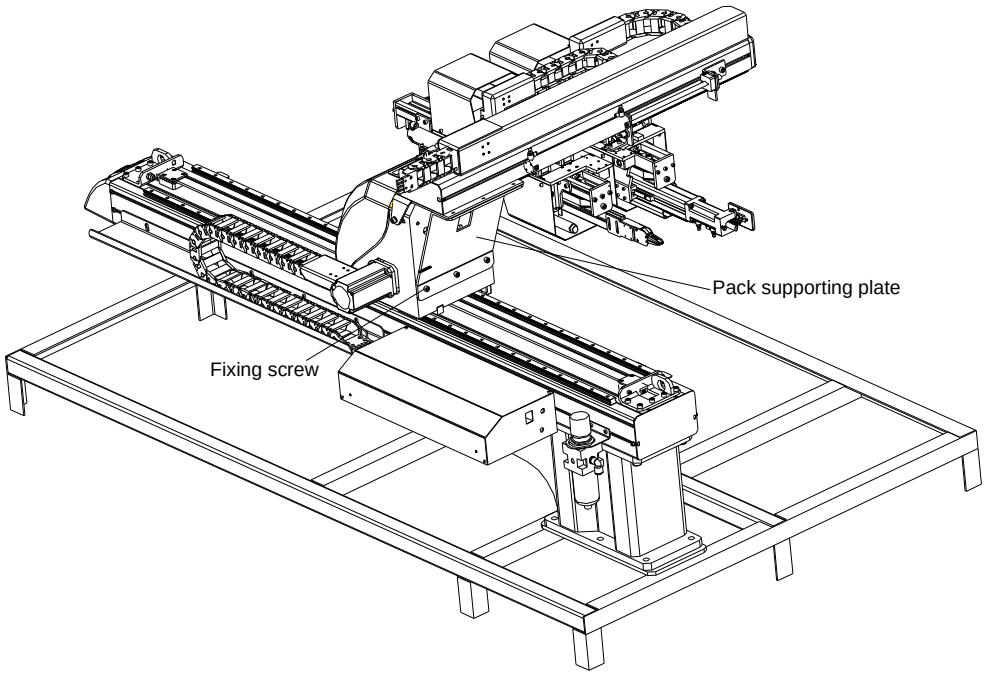
3) Lock the arm connecting plate and the sliding seat by the 6 screws on the supporting plate.

Note: 1) Remove the packing support plate should be careful to prevent the arm wrist and the machine damage or personal injury.

2) Lock the arm connecting plate and the sliding seat, ensure that the arm in vertical state.

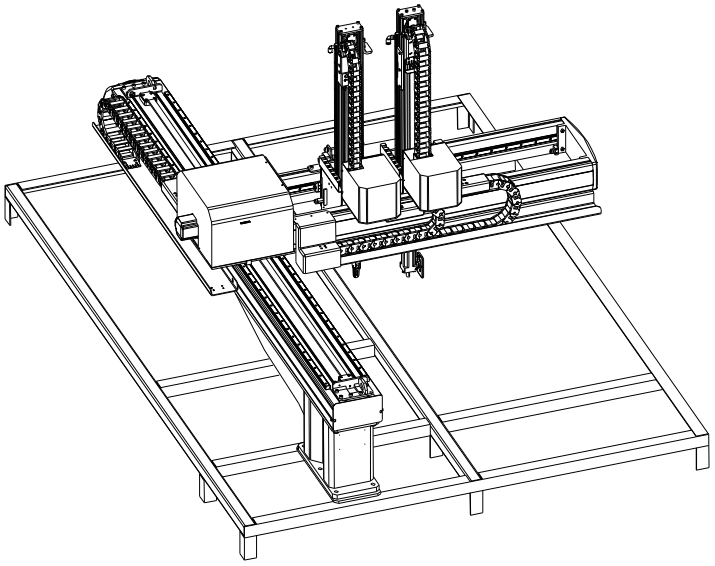
2. There is a ring in the parts box when the robot sent, after taking apart the package, the ring is installed on the "T"-type block of the vertical beam, using with the two ends of beam. (See the picture)

Note: After hoisting, please keep rings of the vertical beam, and use again next time.



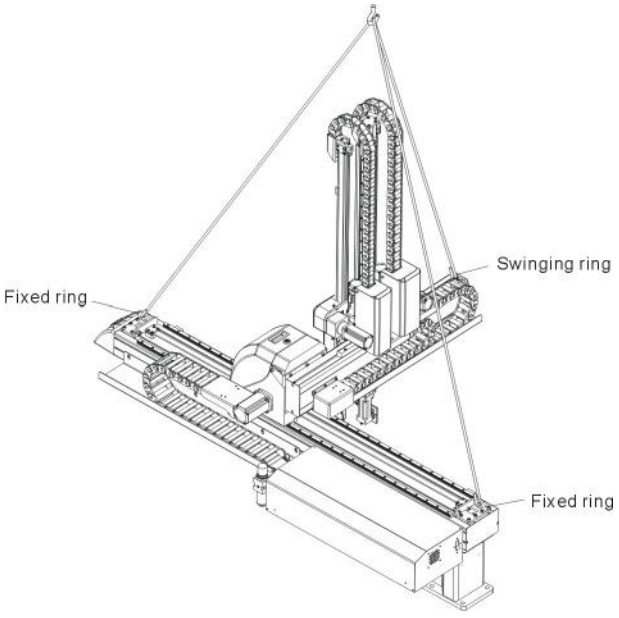
Picture 1-1

Packing of ST1 and ST1-T



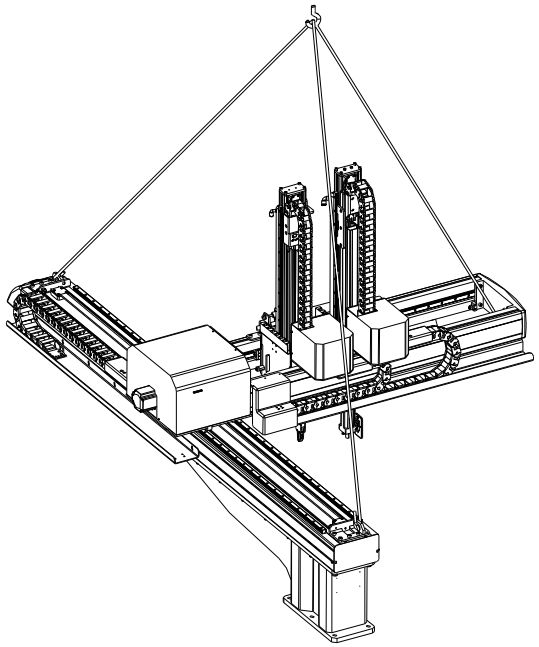
Picture 1-2

Packing of ST1-T(medium telescopic arm)



Picture 1-3

Hanging transportation of ST1 and ST1-T



Picture 1-4

Hanging transportation of ST1-T (medium telescopic arm)

1.4.3 Storage

1. Switch off the main air source and power, if robot is not in use for a long time.
2. Robots should be stored in ventilated, dry room to prevent rust and damping.
3. If not use for a long time, please anti-rust, and if necessary place film to prevent dust and erosion.

1.4.4 Operation Environment

1. Temperature: between +5℃ to +40℃
2. Humidity: Temperature +40℃, relative humidity 50%
3. Elevation: Under 1000 meters above sea level

4. Stop using the product immediately when the following occurs:
   I. Power cable is damaged
   II. Air tube is damaged
   III. Machine breaks down or dissembled by unauthorized personnel.
   IV. There are organic solvent, acidic phospholipids, sulfurous acid, and chlorine, flammable and explosive dangerous matter in compressed air
   Ⅴ. Air pressure is not enough or too high.

1.4.5 Retirement

When the robot goes to its end of service life, it should be demolished according to different martial (metal, oil, lubricants, plastics, rubber, etc.) to split in different ways. Deal with the machine according to local requirements; ensure the commission company as the best.

Any problem during using the SHINI ST1 Series Robot, please contact the company or the local vendor.

Headquarters & Taipei Factory:	TEL: (02)26809119
China Service Hotline:	TEL: 800-999-3222
Dongguan Factory:	TEL: (0769)83313588
Ningbo factory:	TEL: (0574)86719088

2. Installation

2.1 Instruction

2.1.1 Safety Issue

1. Before installation, please read this chapter carefully.
2. Fix robot on the base before operating.
3. After installing robot, indicate the working area with safety fence.
4. The hand controller should be placed outside of the safety fence.
5. Keep the air pipe in good way during installation.
6. The power connection should be performed only by authorized electrician.
7. Connecting cable and the grounded should obey the local rules and regulations.
8. The grounded wire can not attach to the water pipes, gas pipes, telephone lines or television cables.
9. Use the independent cable and power switch, the diameter of main power wire can not be less than the wire of control box.
10. The end of the power wire must be safety and immobility.

2.1.2 Compressed Air Connection

1. According to the filter specifications to choose a suitable hose connected between the air source and the filter.

Note: Before connecting hoses, clean the hoses by compressed air. To ensure that there is no cuttings, sealing tapes in it.

2. Check the air connection of control box in good conditions, without bending conditions.

2.1.3 Electric Power Connection

1. The electrical connection should be performed only by authorized electrician.
2. Shut off the power supply before connecting.
3. Set up the safety electrical outside of the control system to keep the control

system works in normally.

4. Before installation, wiring, operation, and maintenance must be familiar with instructions guide as well as machinery, electronics and security attentions.
5. Ground the wire before robot operating.
6. Wire grounding should connect to metal and keep away from inflammable matter.

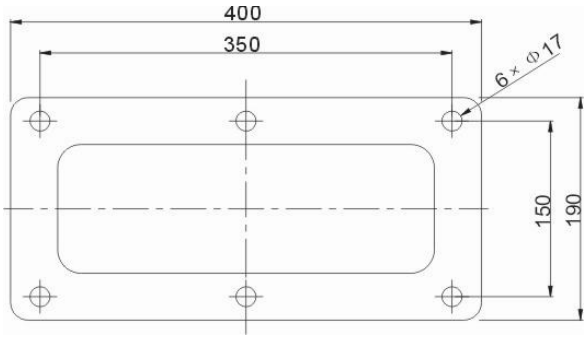
The power requirements are given on the type plate of the robot, the power connection is provided through a normal power cord and a CEE plug.

The power connection should be performed only by authorized electrician and should be in accordance with any applicable regulations.

2.1.4 Safety Fence

1. After installing the robot, indicate the safety fence outside the scope of the robot working area.
2. The hand controller should be fixed outside of the safety fence.
3. Stick the warning signals on outstanding place of the fence.

2.1.5 Mounting Preparation



1. Before drilling, switch off the injection molding machine and then turn off the power, avoid the scrap-iron into the mold.
2. Stick the drilling picture on the installing surface of IMM.
3. Use the center punch to assist drilling.
4. Place the magnetic drill on the fixing plate, use drill bits (Φ14) to drill 6

holes about 30mm depth.

5. Tapping. Use M16 tap to produce internal 6 screws threads about 25mm depth.

2.1.6 Mounting Instruction

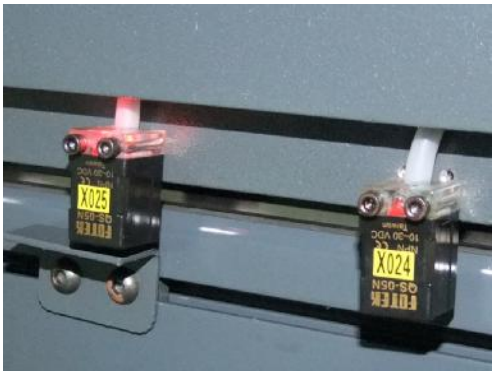
1. Should avoid vibration, collision and falling, when transfer the top of IMM.
2. Alignment holes, using the 8mm torque wrench turn to 77Nm tightens the M16 × 30 hex socket screws.

Note: if with the connection base, fix it on the injection molding machine, then fix robot on connection base.

2.1.7 Robot Reversing

The following paragraph is the instruction for changing robot dropping side. (Operation side / non-operation side) For safety purpose, please turn off the electrical power and pneumatic supply before carry on the instruction.

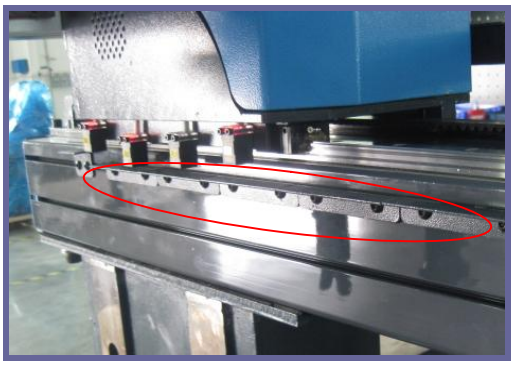
1. Unscrew the proximity sensor X024 and move it up to the same level as X025, then screw X024. Unscrew the proximity sensor X025 and move it down to the same level as where X024 was, and then screw X025. See picture 2-1-1, picture 2-1-2.



Picture 2-1-1: Before modified

Picture 2-1-2: Modified

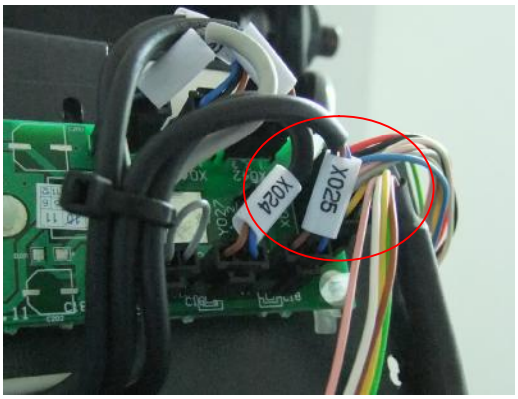
2. Move all “Outside IMM safety zone blocks” from the right end of the beam to the left end of the beam. See picture 2-1-3 .Move the origin block from the left end of the beam to the right end of beam, 100mm away from the limit block. See picture 2-1-4.



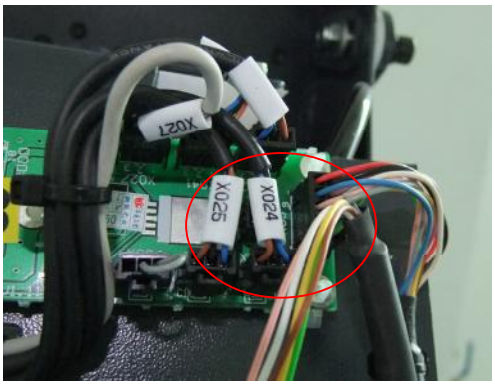
Picture 2-1-3

Picture 2-1-4

3. Open the sliding seat on the Z-axis, and then exchange the socket position of X024 and X025 on the circuit board U3. See picture 2-1-5, picture 2-1-6.



Picture 2-1-5: Before modified



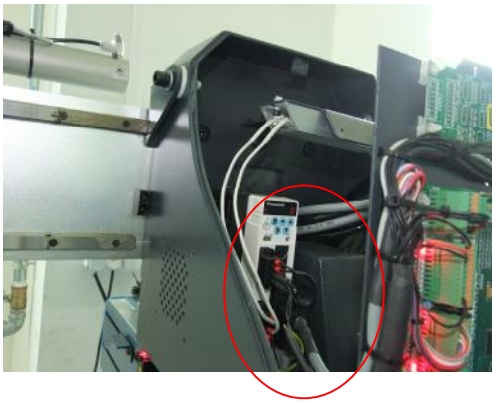
Picture 2-1-6:: Modified

4. Adjust the parameter of transverse servo drive Pr41 from 0 to 1, and Pr46 from 1 to 0.

1. Press “S” key toggle the display to “dp_5pd”, the press “M” key to “PR_00”. Use “△”“▽” to selected number, use “◁” to move cursor. Press “S” again to set the parameter. Use “△”“▽” to adjust parameter, “◁” to move cursor, “S” to confirm the setting. Do this for Pr41 and Pr46.

2. Save setting: Press “M” and follow by “S”, toggle the display to “EE_SEE”, press and hold “△” key until “----” show on the display

(Mode→EE_SEE→Set→Up→----), then switch off the power for at least 3 seconds (if less than 3 seconds cannot save the setting), then switch on the power.



picture 2-1-7: Servo motor traverse position

5. Check the result of reversing.

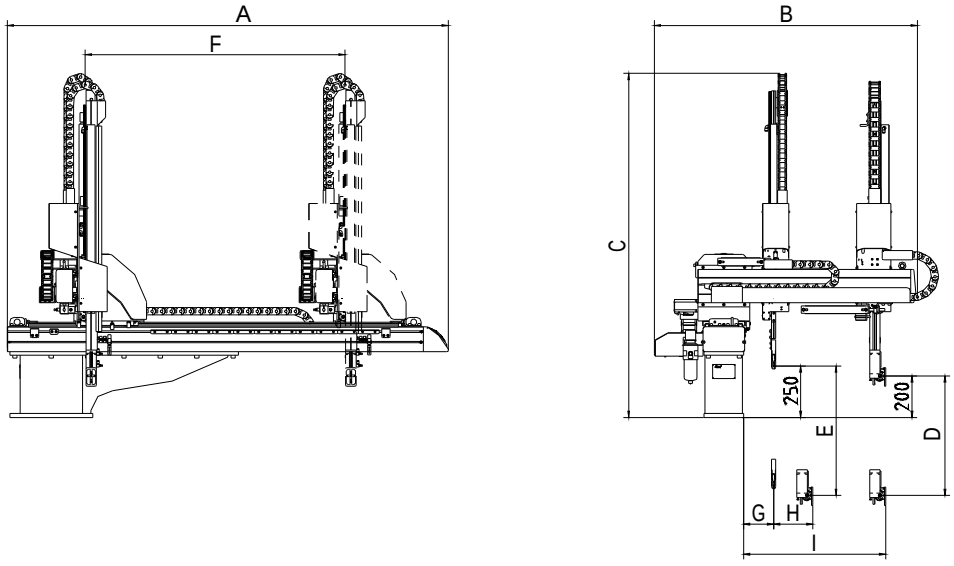
1. When press “HP” back to origin, the traverse direction of robot will opposite with reversing.

2 .When press “HP” back to origin, the proximity sensor X024 should light up.

3 .The end limit sensors (X041 and X042) should light up if robot operates.

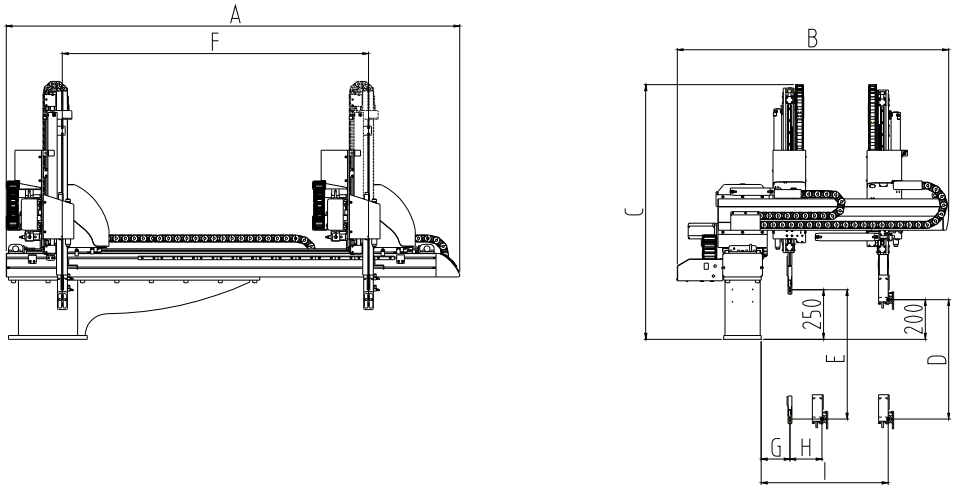
2.2 Equipment Specification

2.2.1 Dimensions (unit: mm)



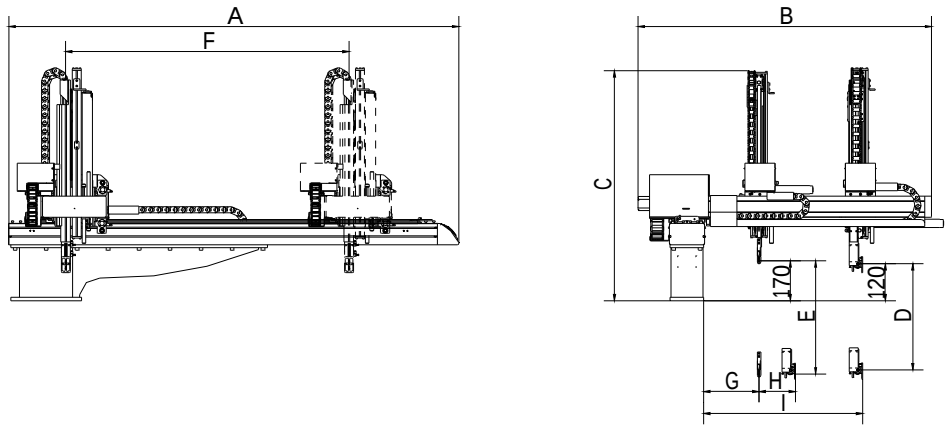
Picture 2-1

ST1



Picture 2-2

ST1-T



Picture 2-3

STI-T（medium telescopic arm）

2.2.2 Model Specification

Chart 2-1: Specification List (ST1)

Model		ST1-550-1000	ST1-550-1000D	ST1-700-1400	ST1-700-1400D
Application IMM(ton)		0-100	0-100	100-200	100-200
Traverse Stoke(mm)		1000	1000	1400	1400
Crosswise Stoke(mm)	Main Arm	125	125	150	150
	Sub-arm		100		100
Vertical Stroke(mm)	Main Arm	550	550	700	700
	Sub-arm		600		750
Max Load(kg)		3	3	3	3
Min Pick-out Time(sec)		2.4	2.4	2.7	2.7
Min Cycle Time(sec)		7.5	7.5	8	8
Air Pressure Range(bar)		4-6	4-6	4-6	4-6
Max Air Consumption(NL/cycle)		9	14	11	17
Net Weight(kg)		210	230	240	260
Dimensions (mm)	A	1750	1750	2150	2150
	B	1300	1300	1300	1300
	C	1500	1500	1650	1650
	D(max)	550	550	700	700
	E(max)		600		750
	F(max)	1000	1000	1400	1400
	G(max)		120		120
	H(max)		180		180
	I(max)	700	700	700	700

Model		ST1-900-1600	ST1-900-1600D	ST1-1100-1800	ST1-1100-1800D
Application IMM(ton)		200-300	200-300	300-450	300-450
Traverse Stroke(mm)		1600	1600	1800	1800
Crosswise Stroke (mm)	Main Arm	250	250	300	300
	Sub-arm		100		150
Vertical Stroke(mm)	Main Arm	900	900	1100	1100
	Sub-arm		950		1150
Max Load(kg)		1	5	5	5
Min Pick-out Time(sec)		3	3	3.3	3.3
Min Cycle Time(sec)		9	9	10	10
Air Pressure Range(bar)		4-6	4-6	4-6	4-6
Max Air Consumption (N/cycle)		15	22	17	26
Net Weight(kg)		250	270	270	290
Dimensions (mm)	A	2350	2350	2550	2550
	B	1400	1400	1600	1600
	C	1850	1850	2050	2050
	D(max)	900	900	1100	1100
	E(max)		950		1150
	F(max)	1600	1600	1800	1800
	G(max)		120		120
	H(max)		180		180
	I(max)	800	800	900	900

Note: 1. “M” stands for middle mold detector, suit for 3-plate mold.
“EM12” stands for EUROMAP12 communication interface.
“EM67” stands for EUROMAP 67 communication interface.
2. Power supply: 1Φ，200~240V，50/60Hz.
3.”*”max air consumption for suction device 60NI/min.

Chart 2-2: Specification List (ST1-T)

Model		ST1-700-1400T	ST1-700-1400DT	ST1-900-1600T	ST1-900-1600DT
Application IMM(ton)		100-200	100-200	200-300	200-300
Traverse Stroke (mm)		1400	1400	1600	1600
Crosswise Stroke(mm)	Main Arm	150	150	250	250
	Sub-arm		100		150
Vertical Stroke(mm)	Main Arm	700	700	900	900
	Sub-arm		750		950
Max Load(kg)		3	3	3	3
Min Pick-out Time(sec)		2.0	2.3	2.0	2.3
Min Cycle Time(sec)		6.8	6.8	7.2	7.2
Air Pressure Range(bar)		4-6	4-6	4-6	4-6
Max Air Consumption(N/cycle)		10	16	12	19
Net weight(kg)		260	280	270	290
Dimensions (mm)	A	2150	2150	2350	2350
	B	1300	1300	1400	1400

	C	1250	1250	1350	1350
	D(max)	700	700	900	900
	E(max)		750		950
	F(max)	1400	1400	1600	1600
	G(max)		120		120
	H(max)		180		180
	I(max)	730	730	850	850

Note: 1. “M” stands for middle mold detector, suit for 3-plate mold.
“EM12” stands for EUROMAP12 communication interface.
“EM67” stands for EUROMAP 67 communication interface.
2. Power supply: 1Φ，200~240V，50/60Hz.
3.”*”max air consumption for suction device 60NI/min.

Chart 2-3: Specification List (ST1-T: middle telescopic arm)

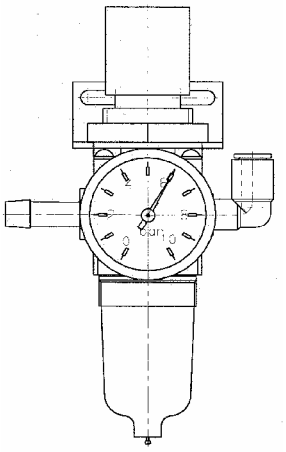
Model		**ST1-1100-1800T**	**ST1-1100-1800DT**	**ST1-1300-2000T**	**ST1-1300-2000DT**
Application IMM(ton)		300-450	300-450	450-650	450-650
Traverse Stroke(mm)		1800	1800	2000	2000
Crosswise Stroke(mm)	Main Arm	400	400	400	400
	Sub-arm		200		200
Vertical Stroke(mm)	Main Arm	1100	1100	1300	1300
	Sub-arm		1150		1150
Max Load(kg)		5	5	5	5
Min Pick-out Time(sec)		2.5	2.5	2.8	2.8
Min Cycle Time(sec)		7.6	7.6	8	8
Air Pressure Range(bar)		4-6	4-6	4-6	4-6
Max Air Consumption(N/cycle)		24	37	26	41
Net Weight(kg)		420	450	440	470
Dimension (mm)	A	2550	2550	2750	2750
	B	1750	1750	1750	1750
	C	1300	1300	1400	1400
	D(max)	1100	1100	1300	1300
	E(max)		1150		1350
	F(max)	1800	1800	2000	2000
	G(max)		120		120
	H(max)		180		180
	I(max)	1150	1150	1150	1150

Model		**ST1-1500-2200T**	**ST1-1500-2200DT**
Application IMM(ton)		650-850	650-850
Traverse Stroke(mm)		2200	2200
Crosswise Stroke(mm)	Main Arm	400	400
	Sub-arm		200
Vertical	Main Arm	1500	1500

Stroke(mm)	Sub-arm		1550
Max Load(kg)		6	6
Min Pick-out Time(sec)		3	3
Min Cycle Time(sec)		8.5	8.5
Air Pressure Range(bar)		4-6	4-6
Max Air Consumption(N/cycle)		29	45
Net Weight(kg)		460	490
Dimensions (mm)	A	2950	2950
	B	1750	1750
	C	1500	1500
	D(max)	1500	1500
	E(max)		1550
	F(max)	2200	2200
	G(max)		120
	H(max)		180
	I(max)	1150	1150

Note: 1. “M” stands for middle mold detector, suit for 3-plate mold.
“EM12” stands for EUROMAP12 communication interface.
“EM67” stands for EUROMAP 67 communication interface.
2. Power supply: 1Φ，200~240V，50/60Hz.
3.”*”max air consumption for suction device 60NI/min.

2.2.3 Pneumatic Source Requirement



Compressed air is connected by 3/8-Φ12 trachea.
Filter pressure valve with a clear scale line, convenient adjustment. Bring adjustment knob upward and with a clockwise rotation, pressure increases; counterclockwise rotation, air pressure decreases, the pressure range between 0 to10bar. After adjustment, Please press the adjustment knob to lock pressure.
Required supply pressure: 4bar-6bar

When the pressure is equal or drop below than 4 bar, the robot will stop working and alarm. When the pressure up to 6bar, It will affect the service life of pneumatic components.
Compressed air consumption depends on the robot accessories.

2.3 Electrical Connection

2.3.1 Main Power Supply

The power requirements are given on the serial plate of the robot, the power connection is provided through cable conductor and CEE plug.

The power connection should be performed only by an authorized electrician and according to applicable electric utility regulations.

2.3.2 Interface with the Injection Molding Machine

The robot is equipped with standard electrical interfaces according to Euromap12 and Euromap67.

Connection of the interface plug to the machine and testing of all signals must be done by a specialist in injection molding machines and robots. Preferably, this should be done by one of our service engineers together with a qualified service engineer for the injection molding machine.

The interface signal functions must be carefully tested, as improper operation may cause malfunction or damage to the robot and molding machine.

In particular, the functions of the safety circuits must be thoroughly checked.

- Testing the emergency stop signals to and from the IMM.

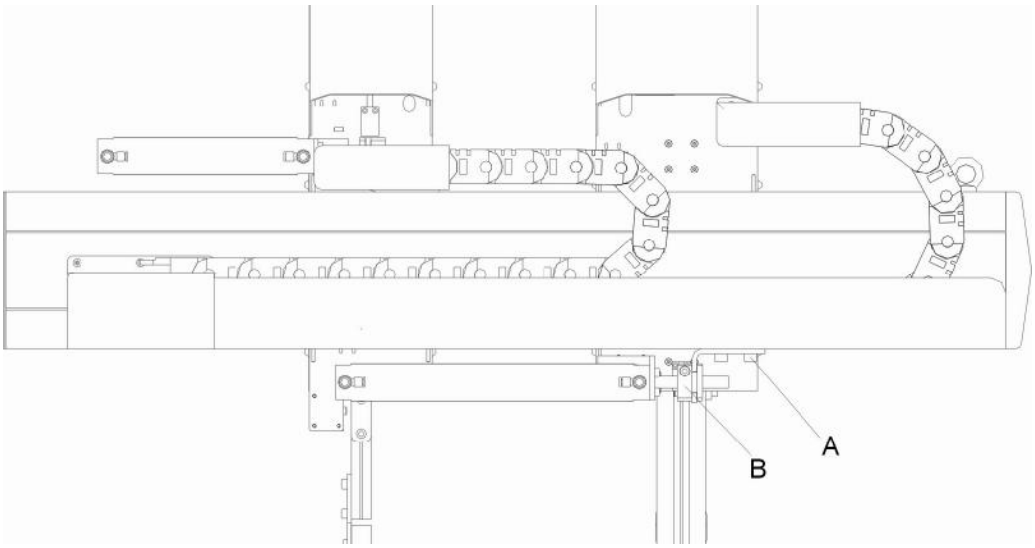
When press the emergency stop switch on hand controller, the error message emergency stop must also be indicated at the IMM. And when press the emergency stop on IMM, the emergency stop signal must also be indicated at the robot.

2.4 Adjusting the Axis Positions

While adjusting the position, make sure that robot can not be run and the compressed air supply is shut off.

2.4.1 Adjusting the X-Position

The X-positions are determined by the stops A, B.



Bracket “A” on X1 axes (main arm) is for adjusting the end-position, and stop package “B” is for adjusting the stroke length and the 0-position.

Bracket “A” on axes X2 (sub-arm) is for adjusting the 0-position, and stop package “B” is for adjusting the stroke length and the end-position.

Before running in to the mold range with the Y-axis for the first time, you must check whether the X-positions can be reached without damaging the mold and the Y-axis. First, the end position of the X-axis must be adjusted.

Adjusting the End –Position of X1 Axis:

1) Run the X1-axis to its end position
2) Release bracket “A”
3) Push bracket “A” to shock absorber, in the compression state
4) Fix the stop package “A”

Adjusting the 0-Position of X1-Axis（the length of stroke）:

1) Release stop package “B”
2) Run the X1-axis to the 0-position
3) Manually push cylinder piston rod to the fully extended state
4) Fix the stop package “B”

Adjusting the 0-Position of X2-axis:

1) Run the X2 -axis to its 0-position
2) Release bracket “A”
3) Manually push bracket “A” to ole-strut, in the compression state
4) Fix the stop package “A”

Adjusting the End-Position of X2-Axis（the length of stroke）:

1) Release stop package “B”
2) Run the X2-axis to its end- position
3) Manually push cylinder piston rod to the fully extended state
4) Fix the stop package “B”

2.4.2 Adjusting the Y- Position

Set the end-position of Y-axis by adjusting up-going shock absorber.

Adjusting the End-Position of Y-axis:

1) Loosen shock absorber on the end position
2) Push the cylinder on Y-axis to its end position
3) Rotate the up-going shock absorber to the in the fully compression state
4) Fix the shock absorber

The withdrawal position can be set using the stop package

Adjusting the Withdrawal Position

1) Run the Y-axis to its end position
2) Seal off the compressed air
3) Loosen the Y-axis stop package
4) Manually push Y-axis to the desired position
5) Push stop package to ole-strut, in the compression state
6) Fix the Y-stop-package

Note: The down shock absorber completely compressed, the top position of shock absorber shall not be lower than the origin of position sensor switch, if not, when arm down, the down-block will damage the origin sensor switch.

2.4.3 Adjusting the Z- Position

The Z-axis position can be set using servo control system.

2.5 Gripper and Suction Monitoring

2.5.1 Gripper Setting

If the gripper didn't clamp parts in opened state or in the closed state, the light of the magnetic switch is off. If the gripper clamed parts, the magnetic switch is on.

Adjusting the Magnetic Switch:

1. Loosen the screw which is fixed on the magnetic switch.
2. Make the light on when gripper clamp the parts, if not make the light off.
3. Tighten the fixing screw after finishing adjustment.

During the robot working, if the grippers not clamp the part, the robot will stop operating and alarm.

2.5.2 Suction Setting

1. The default mode of vacuum switch of is testing mode.

2. In testing mode, press the SET key, toggle the display into pressure setting mode, the step as flowing:

a. In pressure setting mode, P-1 and the current setting value alternately flashing, press SET key will display settings value, at this time, enter into value setting mode by pressing UP and DOWN key.
b. In the value setting mode, the first value in a flashing state, press UP or DOWN key can change values. After setting the first one, press the SET key to set the second value, at this time the second value flashing.
c. After the value setting, press the SET key 1 second or stay in 10 seconds without pressing any key, it will return to testing mode.

3. In testing mode, press SET key at least 2 seconds, enter into initial set mode, the initial setting including output patterns, response time, display color and so on, the step as flowing:

a. In testing mode, press SET key at least 2 seconds into the display color settings, press UP or DOWN key to change display color, press SET key again will toggle to action mode settings.
b. In testing the mode, press SET key twice, or in the display color setting mode, press SET key once to enter into action mode setting, at this time press UP or DOWN key can select action mode, then press SET key

again, the output patterns can be set up, press UP or DOWN key to select the output form. NO meanings normally open, NC for normally closed.

c. In the output mode, press SET to set, will enter the response time setting mode, press UP or DOWN key to set response time, presses SET to enter preset mode automatically.

d. In response time setting mode, press SET key to enter into auto-preset mode, now press UP or DOWN key to select manual mode or automatic mode. After selecting, press SET key, it will return to the testing mode.

2.5.3 Digital Pressure Switch Setting

1. The default setting is 4bar, it can be adjusted according to the actual needs.

2. Digital pressure switch marked with scale, the internal of the digital pressure switch has a red ruler, which connected with the adjustment screw, when the rotation adjustments screw, the red ruler will move too.

3. Need to adjust the pressure, the user can rotate red ruler to set the value by the hex key, clockwise rotation, the value increased, counter-clockwise rotation, the value decrease.

2.6 Robot and IMM Interface

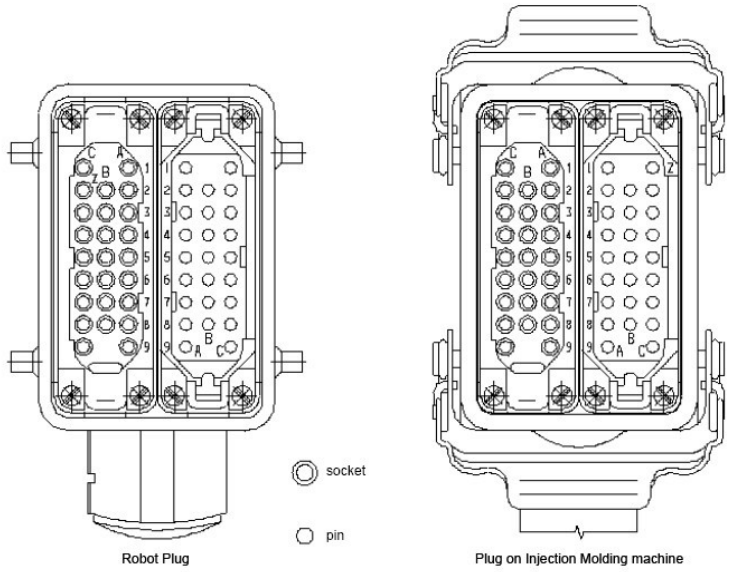
ST1 series robots are available with 2 different interface versions to communicate with the injection molding machine:

- Euromap67
- Euromap12

Both versions are described in the following chapters.

2.6.1 Euromap67 Interface

Euromap67 interface defines the connection plug between the injection molding machine and the robot:



The robot-injection molding machine interface is designed according to the directives of Euromap67, which states:

Unless otherwise noted, the signals, which are maintained during the described function.

2.6.1.1 The Injection Molding Machine Output Signals

Contact NO.	Function
ZA1 ZC1	**Emergency stop channel 1** The emergency stop switch of the injection molding machine is used to interrupt the emergency stop circuit of the robot.
ZA2 ZC2	**Emergency stop channel 2** The emergency stop switch of the injection molding machine is used to interrupt the emergency stop circuit of the robot.
ZA3 ZC3	**Safety system active channel 1** For protecting against hazardous motions of the robot. The switch is closed when the safety system of the injection molding machine is active.
ZA4 ZC4	**Safety system active channel 2** For protecting against hazardous motions of the robot. The switch is closed when the safety system of the injection molding machine is active.
ZA5 optional	**Reject** The signal is HIGH when the molded piece is a reject. The switch is closed when the tool is open and must remain HIGH at least until “close tool enabled” (see pin contact No.A6).
ZA6	**Mold closed** HIGH signal when tool closing has been completed, the signal “close tool enabled” is no longer necessary (see pin contact No.A6).
ZA7	**Mold open** HIGH signal if the mold opening position is equal or more than the required position. Inadvertent alteration to mold opening stroke smaller than that required

	for the robot to approach must be impossible.
ZA8 optional	**Mold at intermediate position** HIGH signal when the mold opening has reached the specified intermediate position and remains HIGH until the mold is completely open. the signal may be used in two ways: 1）The mold stops in the intermediate position, whereupon a signal is sent to the robot. Complete opening of the IMM takes place through the signal “complete mold opening enabled” (see pin A7). 2）The IMM transmits the signal, but does not remain in the intermediate position. Signal is LOW when the intermediate.
ZA9	**Signal voltage robot 24V DC**
ZB2	**Fully automatic mode injection molding machine** HIGH signal, when operating the injection molding machine tighter with the robot is possible.
ZB3	**Ejector back position** HIGH signal when the ejector is back, regardless of the position of the movable tool plate. The signal acknowledges ”ejector back enabled” (see pin contact No.B3).
ZB4	**Ejector forward position** HIGH signal when the ejector is forward. The signal acknowledges “ejector forward enabled “(see pin contact No.B4).
ZB5	**Core pullers 1 free for robot to approach** HIGH signal when the core pullers are in position for removal of the injection moiling.（see pin contact No.B5）
ZB6	**Core pullers 1 in position to remove molding** HIGH signal when the core pullers are in position for removal of the injection molding.（see pin contact No.B6）
ZB7 optional	**Core pullers 2 free for robot to approach** HIGH signal when the ejector is back ,regardless of the position of the movable tool plate, are in position for the robot to approach.（see pin contact No.B7）
ZB8 optional	**Core pullers 2 in position to remove molding** HIGH signal when the core pullers are in position for removal of the injection molding.（see pin contact No.B8）
ZC5/ZC6/ZC7	Reserved for future Euro map signal
ZC8	Free
ZC9	Signal ground robot 0V

2.6.1.2 Robot Output Signals

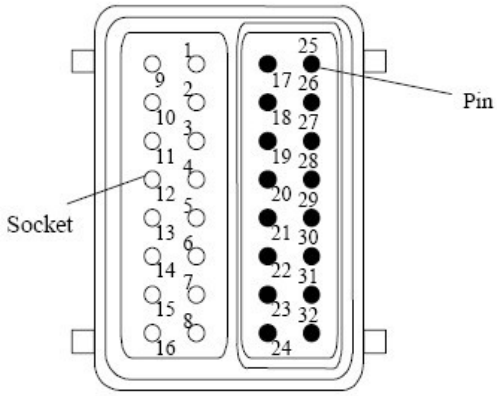
Pin contact No.	Function
A1 C1	**Emergency stop of robot channel 1** Opening of the switch contacts of the robot must shut off the control system of the molding machine.
A2 C2	**Emergency stop of robot channel 2** Opening of the switch contacts of the robot must shut off the control system of the molding machine.
A3 C3	**Mold Ares Free** Signaling is effected by the limit switch at the travel –in rail .the switch is opened when the travel –in rail, in the region of the injection molding machine, leaves its starting position before it is moved into the tool area. If the switch is

	open, neither a closing nor opening motion of the tool may take place. Even when the control system of the robot is shut off, the switch must work as described.
A4 C4	Reserved for future Euromap signal.
A5	free
A6	**Complete mold opening enabled** HIGH signal when the robot is far enough out of the tool that it can be closed and when other robot control systems enable closing of the tool .the signal remains HIGH signal for the duration of the tool –closing operation, in the event of a LOW signal due to a disturbance, the tool-closing motion must be absorbed. Note: the signal “close tool enabled” may not be linked with other or signals in any operating mode.(see pin contact No.ZA47)
A7 optional	**Complete mold opening enabled** HIGH signal when the robot is far enough out of the tool that it can be closed and when other robot control systems enable closing of the tool .the signal remains HIGH signal for the duration of the tool –closing operation, in the event of a LOW signal due to a disturbance, the tool-closing motion must be aborted. Note: the signal “close tool enabled” may not be linked with other or signals in any operating mode.(see pin contact No.ZA47)
A8	Reserved for future Euromap signal
A9	Signal ground IMM 24V DC
B2	**Robot operation mode** LOW signal when the robot mode switch is “operation with injection molding machine”, HIGH signal when the robot mode switch is “no operation with injection molding machine” HIGH signal when the robot is switched off.
B3	**Ejector back enabled** HIGH signal when the removal operation has been performed far enough for the motion “ejector back “to be carried out. the signal is HIGH for the duration of the motion “ejector back “.the signal must be maintained at least until the signal “ejector back “from the molding machine(see pin contact No.ZB3).
B4	**Ejector forward enabled** HIGH signal when the removal operation has been performed far enough for the motion “ejector back” to be carried out. the signal is HIGH for the duration of the motion “ejector back “.the signal must be maintained at least until the signal “ejector back “from the molding machine(see pin contact No.ZB4).
B5 optional	**Enable movement of core pullers 1 to position for the robot to approach freely.** HIGH signal when the motion of the core pullers is to the position for the robot to approach freely is enabled. (see pin contact No.ZB5)
B6 optional	**Enable movement of core pullers 1 to position for removal of the molding.** When the motion of the core pullers is to the position for removal of the molding is enabled.
B7 optional	**Enable movement of core pullers 2 to position for the robot to approach freely.** HIGH signal when the motion of the core pullers is to the position for the robot to approach freely is enabled. (see pin contact No.ZB7)
B8 optional	**Enable movement of core pullers 2 to position for removal of the molding.** When the motion of the core pullers is to the position for removal of the molding is enabled. (see pin contact No.ZB8)
C5 C8	Free
C6	Reserved for future Euromap signal

C7	
C9	Reserved for future Euromap signal

2.6.2 Euromap12 Interface

The interface consists of the plug connection between the injection molding machine and the robot:



Picture 2-4

The robot-injection molding machine interface is designed according to Euromap12, which state:
Unless otherwise noted, the signals are maintained during the described function.

2.6.2.1 Injection Molding Machine Output Signals

Plug Contact NO.	Function
1，9	**Emergency stop of machine** The emergency stop switch of the injection molding machine is used to interrupt the emergence stop circuit of the robot.
2	**Mold open** The switch contact (pin contact 16) is closed when mould opening position is equal or more than required position. Inadvertent alteration to mould opening stroke smaller than that required for the handing device to approach must be impossible.
3，11	**Safety system active** The switch contact is closed when safety devices (e.g. safety guard, footboard safety, etc.) on the injection molding machine are operative so that dangerous movements of the handing device/robot are possible. The signal is active in any operation mode.
4	**Ejector back** The switch contact is closed when the ejector has been retracted regardless of the moving platen position. (See pin contact No.16) acknowledgement f or

	the “Enable ejector back” signal (see pin contact No 21), when the ejector sequence is selected. (see pin contact No.16)
5	**Ejector forward** The switch contact (see pin contact No.16) is closed when the ejector has been advanced. The signal is the acknowledgement signal for the “enable ejector forward” (see pin contact No 22). It is recommended to close the switch contact when the ejector sequence not in use. (see pin contact No.16)
6 optional	**Core pullers free for robot to travel in** Switch (see pin contact No.16) is closed when the core pullers, regardless of the position of the movable tool plate, are in position for free travel –in of the robot.
7 optional	**Core pullers in position for removal of injection moldings** Switch (pin contact No.16) is closed when the core pullers are in position for removal of the injection molding.
8 optional	**Reject** Switch (see pin contact No.16) is closed when the molded piece is a reject. the switch must be closed when the tool is open and must remain closed at least until “enable mould close” (see pin contact No.17)
10	**Fully automatic mode injection molding machine** Switch (see pin contact No.16) is closed when the operating mode selector switch is on “semi-automatic” or “fully automatic mode”.
12	**Mold closed** Switch (see pin contact No.16) is closed when the mould closing has been completed, the signal “enable close” is no longer necessary. (see pin contact No.17)
13 optional	Free
14 optional	**Mold at intermediate position** Switch (see pin contact No.16) is closed when the IMM has reached the specified intermediate position and remains closed until the IMM is completely open .the signal may be used in two ways: 1) Mould opening stops on intermediate position and gives start signal to handling device/robot. mould opening restarts with the signal ”Enable full mould opening”(see contact No.28) 2) Mould opening doesn’t stop on intermediate position, however gives the signal to handling device/robot. (see pin contact No.16) The switch contact is open when intermediate mould opening position is not in use.
15 optional	Free
16	Signal voltage of robot

2.6.2.2 Robot Output Signals

Plug Contact NO.	Function
17	**Enable mould close** The switch contact (see pin contact No.32) is closed when the robot is retracted enough for start of mould closure. the switch contact must remain

	closed at least until “mould closed” (see pin contact No.12)
18，26	**Mould area free** The switch contact is closed when the robot is retracted enough for start of mould closure. If the switch contact opens as a result of a fault, mould closing must be interrupted. The switch contact must be closed if the robot is switch off. It is recommended to close the switch contact when the robot is unselected.
19，27	**Emergency stop of robot** Opening of the switch contacts of the robot must shut off the control system of the molding machine.
20	**Operation with robot** The switch contact (see pin contact No.32) is open when the robot mode switch is “Operation with injection molding machine”. The switch contact is closed when the handling device mode switch is: “No operation with injection molding machine” the switch contact (see pin contact No.32) is closed when the robot is switched off.
21	**Enable ejector back** The switch contact(see pin contact No.32) is closed when the handling device enables the movement for ejector back, the switch contact must remain closed at least until :“Ejector back”signal is given by injection molding machine(see contact No 4)
22	**Enable ejector forward** The switch contact (see pin contact No.32) is closed when the handing device enable the movement for ejector forward. the switch contact must remain closed at least until “ejector forward” signal is given by the injection molding machine(see contact No 5)
23 optional	**Enable motion of core pullers for removal of injection moldings** The switch contact (contact no. 32)is closed when the enable motion of core pullers for removal of injection moldings It is recommended that the switch contact remains closed at least until “the core back to end” signal is given by injection molding machine(see contact No 7)
24 optional	**Enable motion of core pullers for removal of injection moldings** The switch contact (contact no. 32)is closed when the enable motion of core pullers for removal of injection moldings It is recommended that the switch contact remains closed at least until “the core back to end” signal is given by injection molding machine(see contact No 7)
25	Reserved for future use by EUROMAP
28 optional	**Enable full mould opening** The switch contact (see pin contact No.32) is closed when the handling device has taken the part and allows to continue mould opening. The switch contact must remain closed until “mould open” signal is give by the injection molding machine (see contact No 2). If the switch contact is not used it must be open.
29	Reserved for future Euromap signal
30	Free
31	Free
32	Voltage of IMM

3. General Description

3.1 ST1-series Abstract

It can quickly and accurately carry out the parts from inside of mold and place at accurately position. It has a compact, attractive appearance, running smoothly and user-friendly features. In addition, the series can also increase the single arm and double arm, normal arm and telescopic arm according the customers' requirements. It is the best choice for the 2-plate, 3-plate mold users and hot runner mold plate users.

Model: ST1

3.2 Application

1. ST1-550-1000(D) suitable for the use with plastics injection molding machine under 100T.
2. ST1-700-1400(D) suitable for the use with plastics injection molding machine 100T to 200T.
3. ST1-900-1600(D) suitable for the use with plastics injection molding machine 200T to 300T.
4. ST1-1100-1800(D) suitable for the use with plastics injection molding machine 300T to 450T.
5. ST1-700-1400T (DT) is suitable for the use with plastics injection molding machine 200T to 300T.

6. ST1-900-1600T (DT) is suitable for the use with plastics injection molding machine 300T to 450T.
7. ST1-1100-1800T (DT) is suitable for installed on the injection molding machine with mold clamping force within 300T~450T.
8. ST1-1300-2000T (DT) is suitable for installed on the injection molding machine with mold clamping force within 450T~600T.
9. ST1-1500-2200T (DT) is suitable for installed on the injection molding machine with mold clamping force within 650T~850T.

3.3 Features

1. Appearance: European-style streamline, with compact and attractive appearance.
2. Conveniences: I / O circuit connection using convenience plug-in design, easy to installation and maintain.
3. Security: With safety switches on each limited positions.
4. Function: With stack function.
5. Withdrawal: Pick out the spure quickly and accurately, place spure precision, ensure not to collision products.
6. Humanization: Use the humanization control system, easy to operate.
7. Package: Mainly used wrist packing designs, which can save room, avoid damage during transportation.

3.4 Functions

3.4.1 Function Description

ST1 series robot is mainly used for injection molding product and the spure removed, all major parts of the robot are equipped with shock absorber devices and magnetic sensor switch, there is a die locking device with high security features on the arms. The main arm with quickly-pick, accurately-put function, it is not only guarantee the glove extract speed also ensure that the object is not damaged. For the convenience of users packaging, this series robot with stack function, users can achieve two-stack (the X-axis and Y-axis) and Z-axis direction of an arbitrary stack.

3.4.2 Malfunction protection

Both the origin position and end position of the robot’s stroke parts are with limited sensor switch. The devices of the limited position are on the two ends of the stroke axis (Z axis) and vertical axis (X axis), prevent robot anti-falling.

3.4.3 Shock Absorber

There are shock absorbers on the main arm up/down position, sub-arm up/down position, and the position of main arm forward and sub-arm backward. The main arm backward position and the forward position of sub-arm with air- cushion devices, which can reduce the impact of the robot when it is operating.

3.4.4 Function Detection

ST1 series robot with one magnetic reed switch and one proximity switch on vertical cylinder forward and backward, proximity switch on both up and down cylinders on arm.

One magnetic reed switch on gripper of sub-arm and two on rotation board on main arm, protect gripper clip pats and operate normally. If any parts of robot occur accidents, it will stop working and alarm.

3.4.5 Pick and Place

The arm with quickly-pick and accurately-put function, you can adjust the flow regulating valve on the main arm to change the putting speed.

3.4.6 Stacking Function

This series robot with the stack function, choose the stack function of X axis and Y axis in the control system. Stack on X axis can make two layer (start-point and end-point) stacked. The end-point and middle-point can be stacked through Y-axis stack, while the middle-point can be adjusted as your needed.

3.4.7 Self-protection

There is a cylinder anti-falling cylinder at below of the arm ,which can effectively prevent the personal injury or machine damage caused by arm down or lack of air pressure. If air pressure is insufficient, the pressure sensor output signal, the arm back to up-limited, the arm was locked by ejected

anti-falling cylinder piston rod. If the pressure is enough, anti-fall cylinder piston rod returns back.

When the robot's arm in locked state, if need manually push arm up and down, use flat tool to move anti-falling cylinder piston rod back, avoid damage to the arm or anti-falling cylinder.

3.4.8 Emergency Stop Function

The emergency stop button is located on the hand controller.

When an emergency stop button is pressed, the power is turned off. The gripper and vacuum valves and the vacuum pump are not disconnected, to avoid dropping parts from the gripper. In addition, the controllers will remain under power to allow indication of error messages.

If robot goes out of order or need emergency stop for examinations, press the emergency stop button to ensure safety operation.

3.5 Default Setting

1. Speed of transverse: the initial setting is 85%.
2. Pressure sensor: the initial setting is 4bar, if air pressure is less than 4bar, the robot will stop working and alarm.
3. Filter regulating valve: the factory setting is 6bar.
4. Vacuum pressure switch: the factory setting is -50.

4. Operating Instruction

4.1 Hand Controller

4.1.1 Operation Panel of Hand Controller

Picture 4-1

4.1.2 Home Position Setting

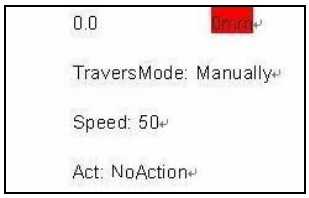
After power on, press

key at state of rest to origin.

4.1.3 Manual Mode

Press

key, show the display as picture 4-2, then can set and adjust robot function manually.（Ensure “mold opened” signal is on. If at the manual mode, please forbidden touching the mold.）



Picture 4-2

1. Current Position: Meanings robots current position, unit: mm.

2. TraversMode (traverse mode): press

to select the manual mode or adjusting micro inching mode.

Manual: Press

or

, after robot operate traverse in or traverse out, stop press the keys, the robot will stop in the start (origin) point.

Inching: Press

or

, robot traverse in or traverse out, if stop press keys, robot will stop this action.

3. Speed (manual speed): set the robot’s speed of traverse.

4. Act (action): present act.

Main arm /Sub-arm /Double arm

Arm up /down

Arm forward/backward

Clip/put

Vacuum suck/put

Vertical /Horizontal moving

Traverse in

Traverse out

Home Position（using it in stop state）

Spare for action

Spare action ON/OFF

In order to ensure the safety of robot and injection molding machine，please pay attention to the following:

1. After robot’s arm going down, it can not go vertical or horizontal.
2. After robot’s arm going down, it can not traverse (except the inside of IMM security zone).
3. No mold open signal, the robot can not go down inside of IMM.

4.1.4 Automation Mode

Press

twice to enter into auto mode display. Press or to set the desired functions.

Picture 4-3

1. Posi(position): the position of the robot arm on the beam axis.

2. AutoT(automation time) : record current automatic cycle time use.

3. Time: The delay time of the current action

4. Act: Current act

5. Mold: Current mold

6. ProSet (production quantity setting): Anticipate the production quantity of the enactment. When the current yield arrives to the set the yield, it will alarm.

7. ProRel (realistic production): Take the quantity that the thing completes the production physically.

Note: Remove product without alert, please remove failures of IMM. Then allow robot to move again.

4.2 The Function Instructions

4.2.1 Basic Function Setting

In STOP display, press

, toggle the display to set function, use cursor key press or to desires function. Press

to switch options.

Lang:	English	MNipCHK:	NOUSE	ProZero:	OFF
ProSet :	5000	SNipCHK:	POSI		
OpenT:	0.5	VacuCHK:	USE		
EjeT:	0.5	HoldCHK:	NOUSE		

Picture 4-4

1. Lang(language): Press

to choice Chinese and English page.

2. ProSet(production setting): When reach the set production, then alarming

3. OpenT(mould open delay): Setting the time, which is from mold stop to cut off the signal of close mode, it will cut off the signal when the time ends.

4. Ejectenable(ejector delay): When it is the time of mold opened, set delay time, when time end the signal of ejector output. (Signals of ejector choose to use)

5. M.ClampCHK(main clamp check):
   Positive: To clip an object successfully, the switch positive testing, and get a signal of gripper switch "On".
   Reverse: To clip an object successfully, the switch reverse testing, and get a signal of gripper switch "OFF".
   NOUSE: The switch of the gripper no testing, the gripper clip the object or not, it should not be recognized signal test.

6. S.ClampCHK(sub clamp heck): Same means as main clip the examination.

7. VacuCHK(vacuum check):
   NOUSE: The signal of the vacuum switch no testing
   USE: To suck an object successfully and get a limit signal ON.

8. HoldCHK (holder check): Same means as vacuum testing.

9. Prozero(the number of productions to zero) : Setting ON, the number of current production shows”0”, usually set OFF

4.2.2 Special Function 1

In WAITING display, press

key 4 times to enter the password page, input 5488, then press

to enter the special function page1, Press to move the cursor to each item. Press

to change and confirm.

CycIT:	60.0	Eje:	USE
AlamT:	20.0	Safe Door:	USE
AccTime:	20.0	MidMold:	USE
		Sound:	USE
Waitpos:	Vert	TransCnt:	1
Waitpos:	In	Prep 1Cnt:	1
Downpos:	Vert	Prep 2Cnt:	1
Stop safe:	NOUSE		
PressCHK :	USE	Dot:	1
BadPrdct :	USE	Dist :	50.0
AutoChk :	USE	X-axes:	NOUSE
		Y-axes:	NOUSE

Picture 4-5

1. CycleTime（cycle time）:
   Time set for system check action. Means the maximum time from current cycle complete to the next Injection Machine mold opened limit. If waiting time exceed the set value, alarm raise.

2. AlarmTime(alarm time) : for the alert time period, while panel shows the alarm page unchanged.

3. AccTime(accelerated time): Set the time of servo motor speedup, slowdown.

Note: the unit of the time of the speedup and slowdown is 10ms.

4. Eje（ejector）:

NOUSE: Allow the ejector output.

USE: After mold open in place, the delay, allow the ejector output.

5. Safe door:

NOUSE: A signal does not be checked.

USE: Before machine descends to take out object, the signal is checked.

6. MidMold（middle mold）:

Use: Remove the machine down extract; it will detect the signal in the formwork.

NOUSE: The signal of mid-mode is not for testing

USE: The robot down to pick objects, it will test the signal of the mid-mode

7. Sound:

Off: No sound while pressing.

On: Sound while pressing.

8. Waitpos(wait posture):

Vertical: Robot in standby modes，the gripper group in the vertical position.

Horizontal: Robot in standby modes，the gripper group in the horizontal position .If subject the mold, and can not in the vertical position ,then can choose vertical stand, when injection molding machine mold open completed, the robot to vertical down, pick things then doing horizontal actions.

9. Waitpos(wait position):

Waiting inside (Waiting inside injection moulding machine): The waiting position is normal.

Waiting outside (Waiting outside injection moulding machine): If the

subject can not stand inside, can choose stay outside. In Auto mode, the arm travel out to the outside waiting position.

10. Downpos(down posture):
Vertical: Robot fall down by a vertical pose, horizontal down will alarm.
Horizontal: Robot fall down by horizontal pose, vertical drop will alarm.

11. StopSafety (stop safety):
NOUSE: When stop, the safe signal of switch-mode still output
USE: When stop, in order to ensure machine safety, open mold to cut off the safe signal of switch-mode, after closing the safe door and then the safe signal of switch-mode output again.

12. Trans Cnt(Conveyer Interval): Conveyor output once every number of model time setting.

13. Prep 1 Cnt: Reservation 1 every number set output once.

14. Prep 2Cnt: Reservation 2 every number set output once.

15. PressCHK(pressure check):
NoUse: Air pressure signal not to check。
Usage: when the air pressure is not reach the setting, arm stop working. The control box will show that the pressure is not enough.

16. Badprdct(Reject Parts):
NOUSE: Controller does not detect the signal of bad product.
USE: Controller defect the signal of bad product.

17. AutoCHK(auto check):
NOUSE: Robot in automatic state does not test the alarm signal.
USE: Robot in automatic state need test the alarm signal, or will alarming.

18. Dot (dots): When need to stack, it is for the Z-axis placing points, 99

points can be set most.

19. Dist (distance): When setting the stack, this for the distance between each points of Z-axis points.

20. X-axes:
    NOUSE: X-axis does not use the stack.
    Use: X-axis using the two points stacks.

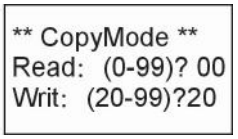
21. Y-axes:
    NOUSE: Y-axis does not use the stack.
    Use: Y-axis using the two points stacks.

Note: When the waiting poses, waiting position, down pose changes, need to ensure that automatic procedures match the set function.

4.2.3 Mold Choice

In WAITING page, press

, enter the mold choice of action program page.



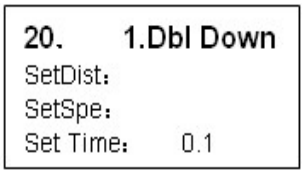
Picture 4-7

Choose one program from the 0-99 to read or then put it into 20-99 to memory as the code of the mold.

4.2.4 Teach

Read the standard action program (0-19 set) or user defined program (20-99

set), press ENTER , enter the teach program page.



Picture 4-8

Move the cursor to teach movement to teach current action steps by steps, and then press ENTER key confirmation, the robot do the action.

INS Input one no action orders in the teach program

DEL Delete current instruction.

20.: The current module, it is the currently selected of mode number.
1: Current sequence, it is the number of the current action.
Dbl Down (two arms down): Teach action, it is the current action

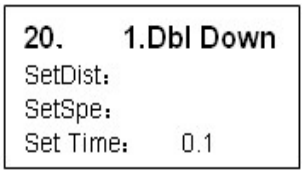
Set Dist (set the distance): Transverse movement to be taught, the arm will be moved to the position.

Set Spe (set the speed): Transverse movement to be taught, it is the speed of the arm moving to the sequence.

Set Time (set the time): The current action delay time, that is the action after the delay time.

4.2.5 Parameters

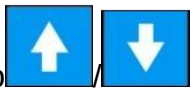
In WAITING page, press PARA, enter the parameters page.



This page can be set the action position, horizontal speed, and delay time, but can not teach. Setting distance and speed should only in the horizontal movement page.

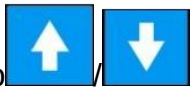
4.2.6 Monitor

Press

, enter the input monitor page, Press to  key to switch monitor pages.

Picture 4-9

Press

, enter the output monitor page, Press to  key to switch monitor pages.

“○”means no signal, “●” means having signal

Picture 4-10

4.3 Standard Action Program

Program 0:
Main arm down -> Main arm forward -> Vacuum suck -> Main arm backward -> Main arm up -> Dais out ->
Pose horizontal -> Main arm down -> Vacuum put -> Main arm up -> Pose vertical -> Dais in

Program 1:
Main arm down -> Main arm forward -> Vacuum suck -> Main arm backward -> Main arm up -> Pose horizontal -> Dais out -> Main arm down -> Vacuum put -> Main arm up -> Pose vertical -> Dais in

Program 2:
Main arm down -> Main arm forward -> Main arm clip ->Main arm backward -> Main arm up -> Dais out -> Pose horizontal -> Main arm down -> Main arm put -> Main arm up -> Pose vertical -> Dais in

Program 3:
Main arm down -> Main arm forward -> Main arm clip ->Main arm backward -> Main arm up -> Pose horizontal -> Dais out -> Main arm down -> Main arm put -> Main arm up -> Pose vertical -> Dais in

Program 4:
Sub arm down -> Sub arm forward -> Sub arm clip -> Sub arm backward -> Sub arm up -> Dais out ->Sub arm put -> Dais in

Program 5:
Double arms down -> Double arms forward -> Vacuum suck -> Sub arm clip -> Double arms backward -> Double arms up -> Dais out -> Sub arm put -> Dais out -> Pose horizontal -> Main arm down -> Vacuum put ->Main arm up -> Pose vertical -> Dais in

Program 6:
Double arms down -> Double arms forward -> Vacuum suck -> Sub arm clip

-> Double arms backward -> Double arms up
Pose horizontal -> Dais out -> Main arm down -> Vacuum put ->Main arm up -> Pose vertical -> Dais in -> Sub arm put -> Dais in

Program 7:
Double arms down -> Double arms forward -> Main arm clip -> Sub arm clip -> Double arms backward -> Double arms up -> Dais out -> Sub arm put -> Dais out -> Pose horizontal -> Main arm down -> Main arm put ->Main arm up -> Pose vertical -> Dais in

Program 8:
Double arms down ->Double arms forward -> Main arm clip > Sub arm clip -> Double arms backward ->Double arms up
Pose horizontal -> Dais out -> Main arm down -> Main arm put -> Main arm up -> Pose horizontal -> Dais in -> Sub arm put -> Dais in

5. Error Connection

Error	Error Caused	Exclusion mode
Error Number 1 After mold opening ,the signal off, and the robot not back to original point	Mold open no signal input	1. IMM not in the mold opens state. 2. The signal of the “mold open” in IMM is abnormal. 3. Check the I/O’s connecting wire. 4. Whether circuit board having errors.
Error Number 2 Middle-plate limit OFF，the robot not back to original point	The middle plate (total 3-plate) no signal input	1. Whether the mid-plate of mold open 2. Whether having signal output of proximity switch in mid-plate mould 3. Check the I/O’s connecting wire. 4. Whether having errors on circuit board.
Error Number 3 Main arm up limit OFF, the robot not back to original point	Main arm up going no signal input, the robot not in the stand-by state	1. Whether the air pressure is too low 2. Whether having the signal of main arm up going proximity switch 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board
Error Number 4 Sub arm up limit OFF, the robot not back to original point	Sub-arm up going no signal input, the robot not in the stand-by state	1. Whether the air pressure is too low 2. Whether having the signal of sub-arm up going proximity switch. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 5 Main clip ON, the robot not back to original point	Main clip has signal input, the robot not in the stand-by state	1. Whether having the signal of main clip 2. Main clip testing right or not 3. check the main clip whether clip the products 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 7 Vacuum suck ON, the robot not back to original point	Sucker valve no action, suck signal input	1. Whether having the signal of suck 2. Whether having the actions of magnetic valve. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 8 Grasp ON, the robot not back to original point	Grasp valve no action，signal of grasper input	1. Whether having the signal of grasper. 2. Whether having the actions of magnetic valve in grasper. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 9	When robot waiting ,do not	1. Whether the power on servo motor

Machine outside the mould，the robot not back to original point	stay inside	ON 2. Whether having “dais in” action by electric control. 3. Whether having trouble on circuit board.
Error Number 10 Stop inside，the robot not back to original point	When robot waiting ,do not stay outside	1. Whether the power on servo motor ON. 2. Whether having “dais out” action by electric control. 3. Whether having trouble on circuit board.
Error Number 11 Pose vertical limit OFF，the robot not back to original point	The signal of vertical limit no input	1. Whether the air pressure is too low 2. Whether having “vertical” action by electric control. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 12 Pose horizontal limit OFF，the robot not back to original point	The signal of horizontal limit no input	1. Whether the air pressure is too low. 2. Whether having “horizontal” action by electric control. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 13 Robot go down to pick objects, the signal ”mold open” OFF	Robot go down to pick objects, the signal ”mold open” OFF	1. Whether having the signal ”mould open” output from IMM. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 14 Robot go down to pick the objects, signal of mild-plate OFF	Robot go down to pick the objects, signal of“ mild-plate open” OFF	1. Whether the mid-plate mould open. 2. Whether having signal of proximity switch in mid-plate mould. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 15 “Mould open” ON Signal of safety door OFF	Safety door no signal output	1. Whether the door of IMM had closed. 2. Whether having signal of safety door. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 16 “Mould open” ON Signal of mild-plate OFF	Signal of “mould open “input Signal of mild-plate no input	1. Whether the mid-plate mould open. 2. Whether having signal of proximity switch in mid-plate mould. 3. Check the I/O’s connecting wire. 4. Whether having trouble on circuit board.
Error Number 17 Main arm uplimit ON Main arm downlimit ON	Both up limit and down limit of main arm have signals input at the same time	1. Whether main arm up /down having troubles. 2. Check the I/O’s connecting wire. 3. Whether having trouble on circuit

		board.
Error Number 18 Main arm forward limit ON Main arm backward ON	Both forward limit and backward limit of main arm have signals input at the same time	1. Whether the switch on main arm up /down having troubles. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 19 Main arm up limit ON Main arm downward ON	Both up limit and down limit of sub arm have signals input at the same time	1. Whether sub arm up /down having troubles. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 20 Main arm forward limit ON Main arm backward ON	Both forward limit and backward limit of sub arm have signals input at the same time	1. Whether the switch on sub arm up /down having troubles. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 21 Dais out limit ON Dais in limit ON	Both dais out limit and dais in limit having signal input at the same time	1. Whether Dais out limit and Dais in limit having troubles. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 22 Pose horizontal limit ON Pose vertical limit ON	Both pose horizontal limit and pose vertical limit having signal input at the same time	1. Whether the switch of pose horizontal limit and pose vertical limit having troubles. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 23 Before arm down, the signal of the "mould open" OFF	Before arm down to pick, the signal of the "mould open" OFF	1. Whether having signal " mould open" output 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 24 Before arm down, the signal of mild-plate OFF	Before robot down to pick up the subjects the signal of middle mode OFF	1. Whether the mid-plate mould open 2. Whether having signal of proximity switch in mid-plate mould 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 25 Before arm down, The signal of the safety door OFF	Before arm down, the safety door have no signals	1. Whether the safety door close. 2. Whether having the signals of safety door. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 26 Before arm downing, the pose vertical limit OFF	When choosing Pose vertical , before arm downing, Pose vertical limit no signal input	1. Whether jig in vertical state. 2. Whether the vertical testing switch having troubles. 3. Check the I/O 's connecting wire. 4. Whether having trouble on circuit board.

Error Number 27 Before arm downing，Pose horizontal limit OFF	When choosing Pose horizontal，before arm downing, Pose vertical limit no signal input	1. Whether jig in horizontal state. 2. Whether the horizontal testing switch having troubles. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 28 Before arm down, Main clip limit ON	Before arm down, the main arm check switch has signal input	1. Whether having main clip action. 2. Whether having trouble on main clip testing. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 29 Before arm down, Sub clip limit ON	Before arm down, the sub arm testing switch has signal input	1. Whether having sub clip action. 2. Whether having trouble on sub clip testing. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 30 Before arm down,，the vacuum suck limit ON	Before arm down，suck testing switch has signal input	1. Whether sucking. 2. Whether having troubles of suck testing switch. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 31 Before arm down, grasp limit ON	Before arm down，grip testing switch has signal input	1. Whether sucking. 2. Whether having troubles of suck testing switch. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 32 Before dais out, Main arm down valve ON	Before dais out, main arm down	1. Whether main arm down.
Error Number 33 Before dais out, Main arm down valve ON	Before dais out, sub arm down	1. Whether sub arm down.
Error Number 34 Before dais out, Main arm up limit OFF	Before dais out, main arm up limit no signal input	1. Whether main arm at the up going station. 2. Whether main arm down. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 35 Before dais out, sub arm up limit OFF	Before dais out, sub arm up limit no signal input	1. Whether sub arm at the up going station. 2. Whether sub arm down. 3. Check the I/O's connecting wire. 4. Whether having trouble on circuit board.
Error Number 36 Before changing pose, main arm down valve ON	Before jig horizontal and vertical moving, main arm down valve ON	1. Whether main arm down

Error Number 37 Before changing pose, sub arm down valve ON	Before jig horizontal and vertical moving, main arm down valve ON	1. Whether sub arm down.
Error Number 38 Main arm down valve OFF Main arm down limit ON	After the main arm down, the signal of main arm up limit input	1. Whether the air pressure is too low. 2. Whether arm down. 3. when main arm down, the switch of up limit ON or OFF. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 39 Main arm down valve ON Main arm down limit OFF	After the main arm down, the signal of main arm down limit input	1. Whether the air pressure is too low 2. Whether main arm down 3. Whether the down switch having the signal 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 40 Main arm down valve OFF Main arm go up OFF	After the main arm down, no signal of main arm up limit input	1. Whether the air pressure is too low. 2. Whether main arm go up. 3. Whether main arm up switch having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 41 Main arm down valve OFF Main arm down limit ON	After the main arm up, signal of main arm down limit input	1. Whether the air pressure is too low. 2. Whether main arm go up. 3. Whether main arm down switch having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 42 Sub arm down valve ON Sub arm uplimt ON	After the sub arm down, signal of sub arm up limit input	1. Whether the air pressure is too low. 2. Whether sub arm go up. 3. Whether sub arm up switch having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 43 Sub arm down valve ON Sub arm down limit OFF	After the sub arm down, no signal of sub arm down limit input	1. Whether the air pressure is too low. 2. Whether sub arm go up. 3. Whether sub arm down switch having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 44 Sub arm down valve OFF Sub arm uplimt OFF	After the sub arm UP, no signal of sub arm up limit input	1. Whether the air pressure is too low. 2. Whether sub arm go up. 3. Whether sub arm up switch having

		signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 45 Sub arm down valve OFF Sub arm up limit ON	After the sub arm down, signal of sub arm down limit input	1. Whether the air pressure is too low. 2. Whether sub arm go down. 3. Whether sub arm down switch having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 46 Main arm forward valve ON Main arm forward limit OFF	After main arm go forward, no signal of main arm forward limit input	1. Whether the air pressure is too low. 2. Whether main arm go forward. 3. Whether the main arm go forward having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 47 Main arm forward valve ON Main arm backward limit ON	After main arm go forward, the signal of main arm backward limit input	1. Whether the air pressure is too low. 2. Whether main arm go forward. 3. Whether the main arm go backward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 48 Main arm forward valve OFF Main arm forward limit ON	After main arm go back, the signal of main arm forward limit input	1. Whether the air pressure is too low. 2. Whether main arm go backward. 3. Whether the main arm go forward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 49 Main arm forward valve OFF Main arm backward limit OFF	After main arm go back ,no signal of main arm backward limit input	1. Whether the air pressure is too low. 2. Whether main arm go backward. 3. Whether the main arm go backward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 50 Sub arm forward valve ON Sub arm forward limit OFF	After sub arm go forward, no signal of sub arm forward limit input	1. Whether the air pressure is too low. 2. Whether sub arm go forward. 3. Whether the sub arm go forward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 51 Sub arm forward valve ON Sub arm backward limit ON	After sub arm forward, sub arm back ward having signal input	1. Whether the air pressure is too low. 2. Whether sub arm go forward. 3. Whether the sub arm go backward switches having signals. 4. Check the I/O's connecting wire.

		5. Whether having trouble on circuit board.
Error Number 52 Sub arm forward valve OFF Sub arm forward limit ON	Sub arm back, sub arm has signal for forward.	1. Whether the air pressure is too low. 2. Whether sub arm go backward. 3. Whether the sub arm go forward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 53 Sub arm forward valve OFF Sub arm backward limit OFF	Sub arm back,, signal of sub arm back no input	1. Whether the air pressure is too low. 2. Whether sub arm go backward. 3. Whether the sub arm go backward switches having signals. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 54 Main clip valve ON Main clip limit OFF	Main clip ,signal of main clip no input	1. Whether the air pressure is too low. 2. Whether main gripper clip. 3. Whether main gripper clip the products. 4. Check the I/O 's connecting wire. 5. Whether having trouble on circuit board.
Error Number 55 Main clip valve OFF Main clip limit ON	Main put ,main clip having signal input	1. Whether the air pressure is too low. 2. Whether main gripper clip. 3. Whether main gripper clip the products. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 56 Sub clip valve ON， Sub-grip limit OFF	Main clip ,sub clip no signal	1. Whether the air pressure is too low. 2. Whether sub gripper clip. 3. Whether sub gripper clip the products. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 57 Sub clip valve OFF Sub clip limit ON	sub clip ,sub clip has signal	1. Whether having sub put action. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 58 Vacuum valve ON， Vacuum limit OFF	After sucking and putting, the signal of suck not input	1. Whether the air pressure is too low. 2. Whether sucking. 3. Whether suck the objects. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 59 Vacuum valve OFF Vacuum limit ON	After sucking and putting, the signal of suck input	1. Whether having suck and put actions. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit

		board.
Error Number 60 grasper limit ON grasper limit OFF	After grasping, the signal of the grasp not input	1. Whether the air pressure is too low. 2. Whether having grasp action. 3. Whether grasping objects. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 61 grasper limit OFF grasper limit ON	After grasping, the signal of the grasp input	1. Whether having grasp and put actions. 2. Check the I/O 's connecting wire. 3. Whether having trouble on circuit board.
Error Number 62 Pose horizontal valve ON Pose horizontal limit OFF	Pose horizontal, pose horizontal limit no signal input	1. Whether the air pressure is too low. 2. Whether having pose horizontal action. 3. Whether the switch of pose horizontal having signal. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 63 Pose vertical valve ON Pose vertical limit OFF	Pose vertical, Pose vertical limit no signal input	1. Whether the air pressure is too low. 2. Whether having pose vertical action. 3. Whether the switch of pose vertical having signal. 4. Check the I/O's connecting wire. 5. Whether having trouble on circuit board.
Error Number 64 The time of dais out is too long	The time of dais out is longer than that of defining	1. The speed of dais out slow or not. 2. Whether the arm having dais out. 3. Whether the servo driven rotating. 4. Check whether the connecting is right. 5. Whether having trouble on circuit board.
Error Number 65 The time of dais in is too long	The time of dais in is longer than that of defining	1. The speed of dais in slow or not. 2. Whether the arm having dais in. 3. Whether the servo driven rotating. 4. Check whether the connecting is right. 5. Whether having trouble on circuit board.
Error Number 66 Emergency stop	Emergency stop on IMM or robot	1. Loose emergency stop button on controller. 2. Loose emergency stop on IMM. 3. Check the connection line of emergency stop.
Error Number 67 Action programs incomplete, no action	Teach programs incomplete	1. Reset teach program, teaching the last action to be back to start point.

Error Number 68 Up to set production	Current production has reached the setting	1. Increase values of yield. 2. Clear the current yield.
Error Number 69 Action not according with the program	Manual to move arm up /down inside not according with the automatic program	1. Manual operation make arm rise inside and fall in forward or backward position which corresponding automatic process, otherwise may damage the mold.
Error Number 70 The time of waiting open mould delay	The time of the IMM open mould cycle is too long	1. Lengthen the cycle time of electronic control of robot, and make the time longer than that of open mold of injection molding machine.
Error Number 71 Servo-drive failure, no pulse input	Electric receive servo drive feedback pulse or not	1. Check servo drive setting parameter. 2. Check servo drives and electric control connecting. 3. Check setting parameter of electric control. 4. Whether having trouble on circuit board.
Error Number 72 Servo driven alarm	Servo driven alarm	1. Check whether the servo driven alarm. 2. Check servo driven and electric control connecting. 3. Whether having trouble on circuit board.
Error Number 73 The position of the safety door not set	The position of the safety door not set	1. Set the position of the safety door.
Error Number 74 The position of the placing lower than that of safe door	Setting the position of the placing lower than that of safe door	1. Reset the position of the place, the position must be higher than safe door.
Error Number 75 The position of the placing goods is more than the maximum	The position of the placing goods is set more than the maximum	1. Reset the position of the placing goods, make it less than the maximum.
Error Number 76 Outside waiting position is less than the initiation value position	The outside waiting position is less than the initiation position	1. Reset the outside waiting position, must more than the initiation position.
Error Number 77 The position of the placing goods is more than the maximum	The outside waiting position is more than the maximum	1. Reset the outside waiting position, must more than the maximum.
Error Number 78 Points of cycle placing position is more than safe limits	Maximum of Cycle placing position is more than safe limits	1. Reset points of cycle placing or distance of cycle placing.
Error Number 79 Travel out limit is abnormal	The travel out limit switch has no signal input	1. Check whether having the signal of the limit switches. 2. Check the I/O's connecting wire.

		3. Whether having trouble on circuit board.
Error Number 80 Travel in limit is abnormal	The travel in limit switch has no signal input	1. Check whether having the signal of travel in limit switch. 2. Check the I/O's connecting wire. 3. Whether having trouble on circuit board.
Error Number 81 Machine is not in the origin position, travel back to the origin manually	Machine is not in the origin position, travel back to the origin manually	1. Manual back to the origin.
Error Number 82 Machine is not in the waiting position, travel back to the waiting position manually	Machine is not in the waiting position, travel back to the waiting position manually	1. Manual traverse out to waiting position.
Error Number 83 Before travel in /out, the arm is not in horizontal position, horizontal actions first.	Before travel in /out, the arm is not in horizontal position, horizontal actions first.	1. Manually make wrist cylinder in a horizontal position. 2. Check whether the level of limit switch having troubles.
Alarm No. 84 Robot is not at the ends of the traverse beam.	Robot is not at the ends of the traverse beam.	1. Use manual to traverse in (out) the robot to the end. 2. Check the "traverse in limit sensor" signal is available. 3. Check the "traverse out limit sensor" signal is available.
Alarm No. 85 Insufficient inlet pressure.	Insufficient inlet pressure.	1. Check inlet pressure. 2. Check the signal of pressure sensor.
Alarm No. 86 "Mould area free" position setting is smaller than starting position.	"Mould area free" position setting is smaller than starting position.	1. Reset "Mould area free" position, this value must be greater than starting position.
Alarm No. 87 "Mould area free" position setting is greater than safety door position.	"Mould area free" position setting is greater than safety door position.	1. Reset "Mould area free" position, this value must be smaller than safety door position.
Alarm No. 88 "Mould area" descend position is not safe.	"Mould area" descend position is not safe.	1. Reset "mould area" descend position，this value must be smaller than "Mould area free" position.
Alarm No. 89	Traverse out position is	1. Reset traverse out position, this

Traverse out position is smaller than starting position.	smaller than starting position.	value must be greater than starting position.
Alarm No. 90 Traverse out position is greater than maximum position.	Traverse out position is greater than maximum position.	1. Reset traverse out position, this value must be less than maximum position.
Alarm No. 91 Robot does not receive automation signal from IMM.	Robot does not receive automation signal from IMM.	1. Check automation signal from IMM. 2. Check the wiring for automation signal. 3. Check main control board of robot.
Alarm No. 92 Communication fails between control board and hand controller.	Communication fails between control board and hand controller.	1. Check the wiring between control board and hand controller. 2. Check the control board.
Alarm No. 93 Before arm descend outside IMM, does not receive “outside IMM safe zone”	Before arm descend outside IMM, does not receive “outside IMM safe zone”	1. Change the descend position to “outside IMM safe zone”
“Use robot” is not selected.	“Use robot” is not selected.	1. Select “use robot” from IMM.

6. Maintenance

6.1 General

Please observe the prescribed maintenance intervals. Proper maintenance ensures trouble-free functioning of the robot. Proper maintenance is necessary in order that the warrantee be fully enforceable.

Maintenance should be performed by qualified personnel only.

Maintenance should responsibility for safety equipment becomes the responsibility of the system operator once he accepts the robot.

Please note, in particular, that safety instructions marked with must be observed according to regulations so that fully functionality of this equipment can be guaranteed.

Before carrying out maintenance work, and entering the safety zone of the robot, the main switch and compressed air must be disconnected and the compressed air system must be evacuated.

6.2 Lubrication Requirements

Remove the old grease from the guide shafts and scraper rings of the bearing using a cloth. Then apply the new grease to the guide shafts using a brush.

As well as all roller bearing greases according to DIN 51825.

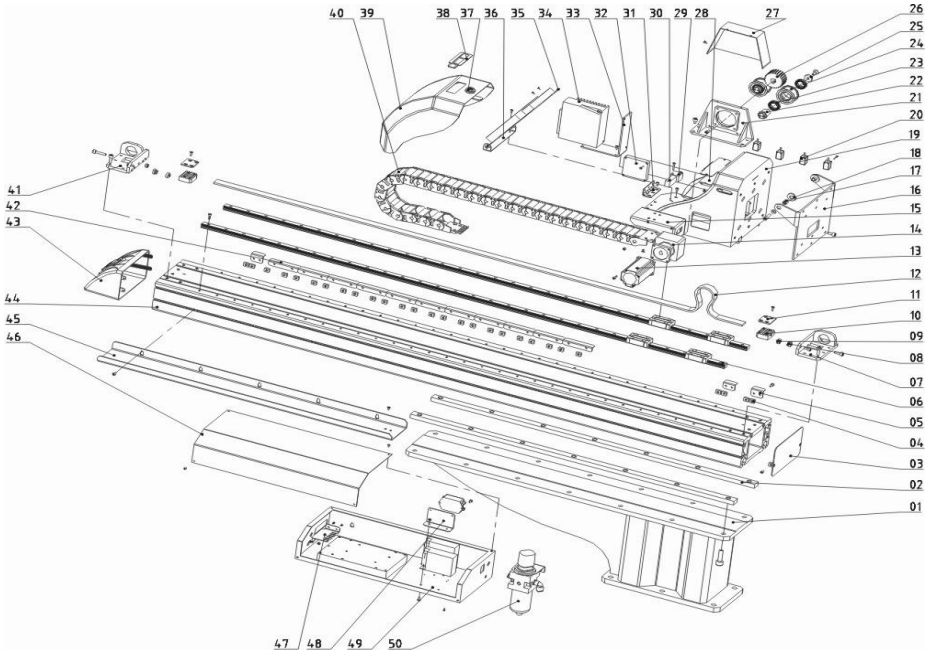
6.2.1 Maintenance cycle

In accordance with the maintenance cycle, make work in the best way.

Daily Maintenance	Monthly Maintenance	Quarterly Maintenance
1. Swab robot. 2. Filter drainage. 3. Check the air pressure. 4. Check bolt connection robot and injection molding machine whether tighten. 5. Check all block settings whether tightened.	1. Use air clean filter. 2. Check the screws on all part whether tightened. 3. Confirm whether the pipelines break or loose. 4. Check and adjust the operating speed.	Brush oil on to the axis.

7. Assembly Diagram

7.1 Traverse Unit (ST1 and ST1-T)



1. Base 2. Fixing plate of beam installation 3. End cover of beam 4. Fixing sliding block

5. Limited sensor panel 6. Linear guiding rail 7. Belt fixing frame 2 8. Buffer unit 9. Buffer cap

10. Belt holding plate 11. Belt splint connecting piece 12. Synchronous belt 13. Servo motor

14. Speed reducer 15. Fixing plate of traverse drag chain

16. Vertical aluminum profile connection board 17. Fixing shaft on vertical beam 18. Washer

19. Sliding seat 20. Proximity switch 21. Motor supporting frame 22. Connection shaft

23. Pulley bearing 24. Pulley 25.Special washer 26.synchronous pulley 27.Motor supporting cover

28.Brake resistor 29. Fixing plate of pressure switch 30. Pressure switch 31. Hinge

32. Exhaust fan 33. Driven mounting plate 34. Servo drive

35. Traverse terminal installation frame 36. Traverse terminal bottom frame

37. Lock 38. Trapezoid plastic handle 39. Sliding seat cover 40. Traverse drag chain

41. Belt fixing frame 1 42. Safety sensor panel of mold 43. End cover of traverse beam

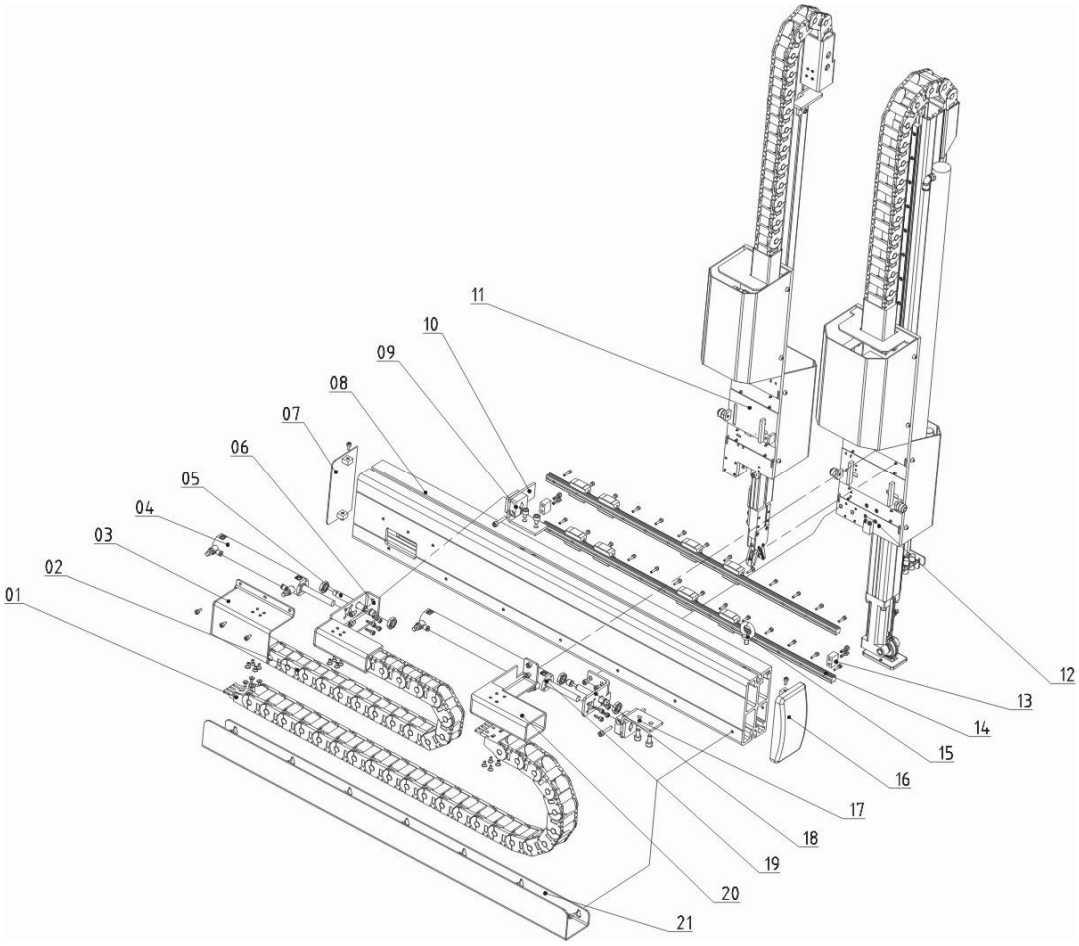
44.Aluminum profile of traverse 45. Traverse drag chain supporting frame

46. Cover of control box 47. Connection plate of grounder 48. Filter mounting plate

49. Control box 50. Filter regulating valve

Picture 7-1

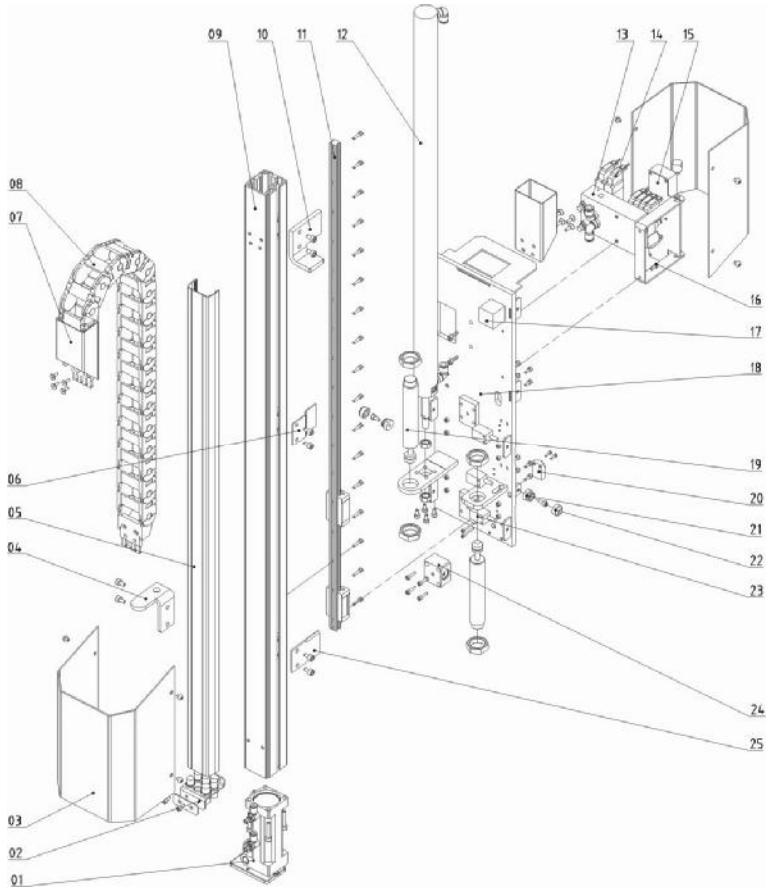
7.2 Vertical Unit (ST1)



1. Vertical drag on main arm 2. Vertical drag on sub-arm 3. Cover of drag
4. Vertical cylinder on sub-arm 5. Shock absorber 6. Vertical drag frame on sub-arm
7. Left cover of vertical arm 8. Vertical aluminum profile 9. Piston rod
10. Vertical cylinder holder frame of sub arm 11. Sub-arm 12. Main arm
13. Limit block 14. Linear guiding rail 15. Lifting rings 16. Right cover of vertical
17. Cylinder holder frame on main arm 18. Fixing frame of vertical cylinder
19. Vertical cylinder on main arm 20. Vertical drag frame on main arm
21. Vertical drag supporting frame

Picture 7-2

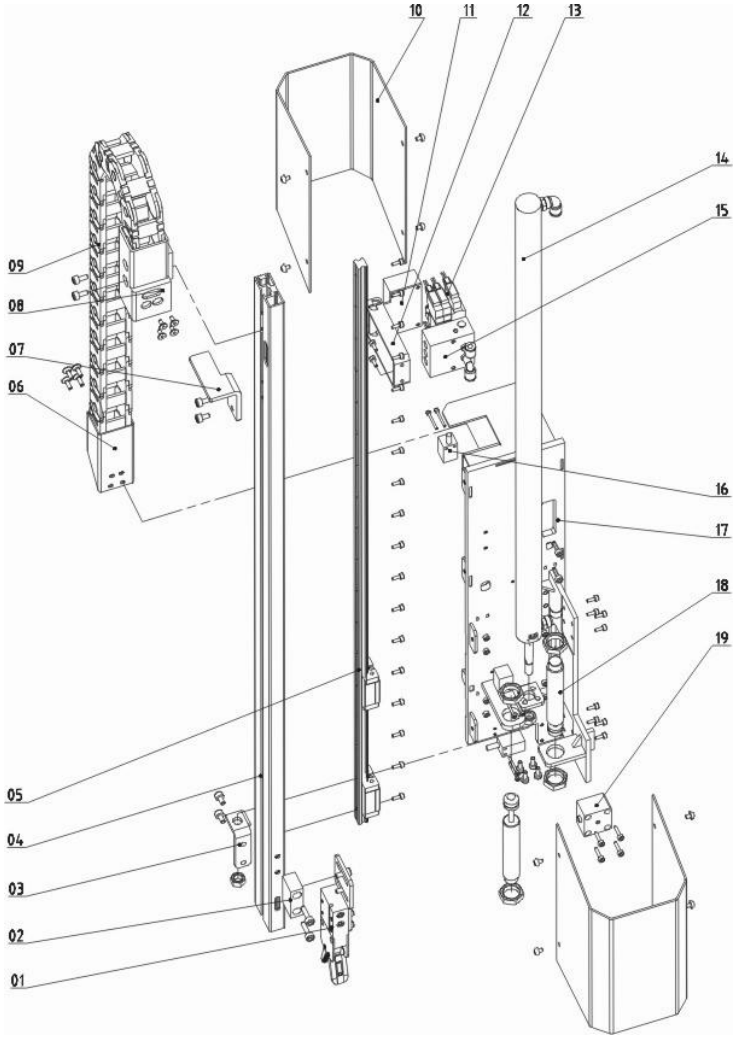
7.3 Main arm unit (ST1)



1. Rotation board 2. Spare frame for air pipe 3. Steel covers of main arm
4. Cylinder holder frame on main arm 5. Aluminum cover of main arm
6. Stack sensor sheet 7. Drag chain connector on main arm
8. Drag chain on main arm (up/down) 9. Main arm aluminum profile
10. Down sensor sheet on main arm 11. Linear guiding rail
12. Cylinder on main arm (up/down) 13. Pneumatic distribution block on main arm
14. Magnetic valve 15. Connection mounting plate on main arm
16. Terminal bottom frame on main arm 17. Digital display pressure switch
18. Main arm mounting plate 19. Shock absorber 20. Proximity switch
21. Buffer unit 22. Buffer cap 23. Proximity switch
24. Falling- proof cylinder 25. Up-going sensor sheet on main arm

Picture 7-3

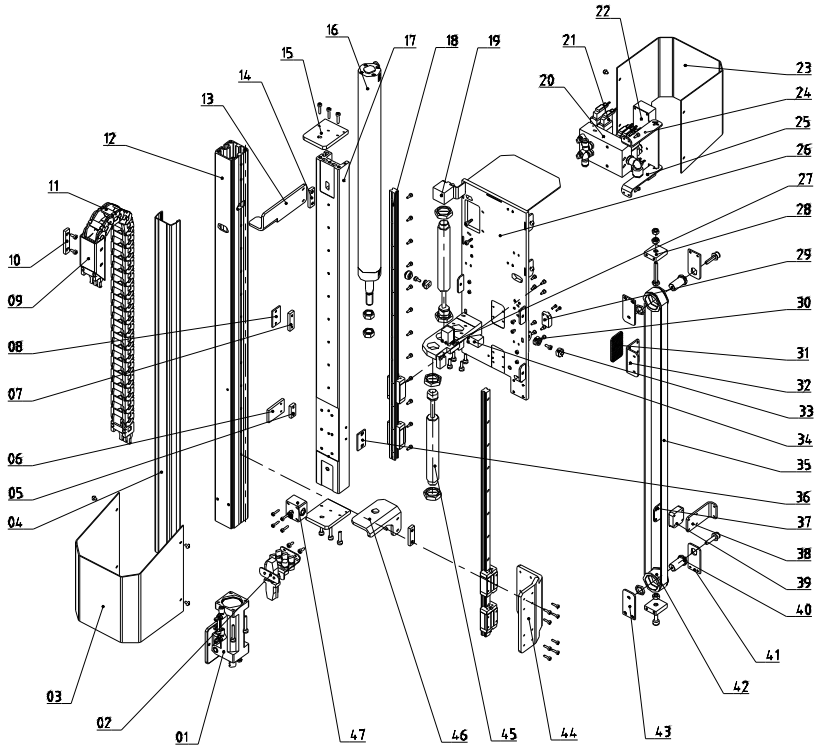
7.4 Sub-Arm unit (ST1)



1. Gripper 2. Up-going buffer block 3. Cylinder holder frame on sub-arm
4. Aluminum profile of sub-arm 5. Linear guide 6. Drag chain connector on sub arm
7. Down baffle on sub arm 8. Drag chain connector unit on sub arm (up /down) 1
9. Drag chain on sub arm (up/down) 10. Steel cover on sub arm
11. Terminal mounting plate on sub-arm 12. Terminal bottom frame on sub-arm
13. Magnetic valve 14. Cylinders on sub arm (up /down)
15. Pneumatic distribution block on sub-arm 16. Proximity switch
17. Sub arm mounting plate 18. Shock absorber 19. Anti-falling cylinder

Picture 7-4

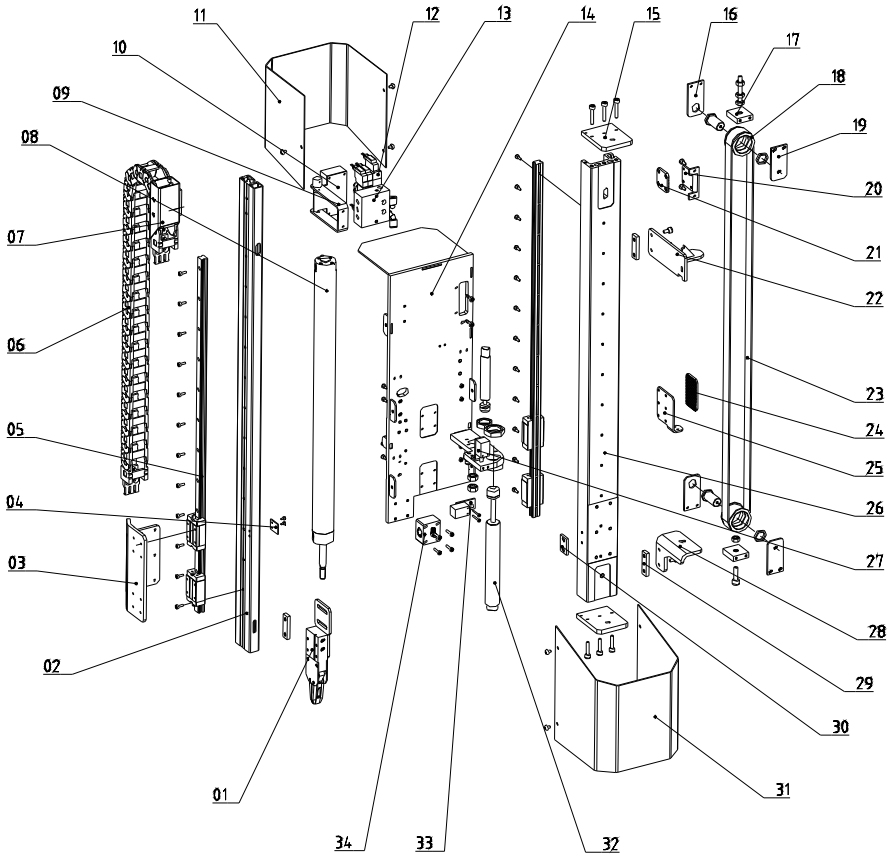
7.5 Main Arm (ST1-T)



01. Upturning setup 02. Spare frame for air tube 03. Steel cover of main arm 2
04. Aluminum cover of main arm 05. Fixing plate 06. Origin sensor plate
07. Sensor fixing plate 08. Stack sensor sheet 09. Drag chain connector parts of main arm 1
10. Drag chain connector parts of main arm 2 11. Drag chain on main arm (up/down)
12. Aluminum profile of main arm 13. Down buffer plate 1 of main arm 14. Sensor fixing plate
15. Belt fixing plate 1 16. Cylinder on main arm (up/down) 17. Aluminum profile of main arm
18. Linear guide 19. Pressure switch with digital display
20. Pneumatic distribution block on main arm 21. Magnetic valve
22. Trunking mounting plate of main arm 23. Steel cover of main arm 1
24. Terminal bottom frame 1 25. Terminal bottom 2 26. Main arm mounting plate
27. Proximity switch mounting plate 28. Fixing plate of pulley 3 29. Proximity switch
30. Buffer mounting unit 31. Tooth plate 2 of arm belt 32. Up-going fixing plate 1 of sub arm belt
33. Buffer cap 34. Proximity switch 35. Synchronous belt 36. Stack sensor sheet
37. Tooth plate 1 of arm belt 38. Up-going fixing plate of belt 39. Tooth plate 2 of arm belt
40. Connection shaft of telescopic arm 41. Fixing plate of pulley 1 42. Pulley on telescopic arm
43. Fixing plate of pulley 2 44. Linear slides mounting plate 1 45. Shock absorber
46. Cylinder holder frame of main arm 47. Anti-falling cylinder

Picture 7-5

7.6 Sub-arm (ST1-T: Telescopic Arm)



01. Gripper 02. Aluminum profile of sub-arm 03. Linear slides fixing plate 1 04. sensor sheet

05. Linear guide 06. Drag chain on sub-arm (up/down) 07. Drag connector 1 on sub-arm

08. Cylinder (up/down) on sub-arm 09. Terminal bottom frame on sub-arm

10. Trunking frame on sub-arm 11. Steel cover 1 of sub arm 12. Magnetic valve

13. Pneumatic distribution block on sub-arm 14. Sub-arm mounting plate 15. Belt fixing plate 1

16. Pulley fixing plate 1 17. Pulley fixing plate 3 18. Pulley on telescopic arm

19. Pulley fixing plate 2 20. Up-going fixing plate 1 of sub-arm belt

21. Tooth plate 2 of Arm belt 22. Sub-arm down-going baffler 23. Synchronous belt

24. Tooth plate 3 of Arm belt 25. Belt fixing plate 26. Aluminum profile of sub-arm

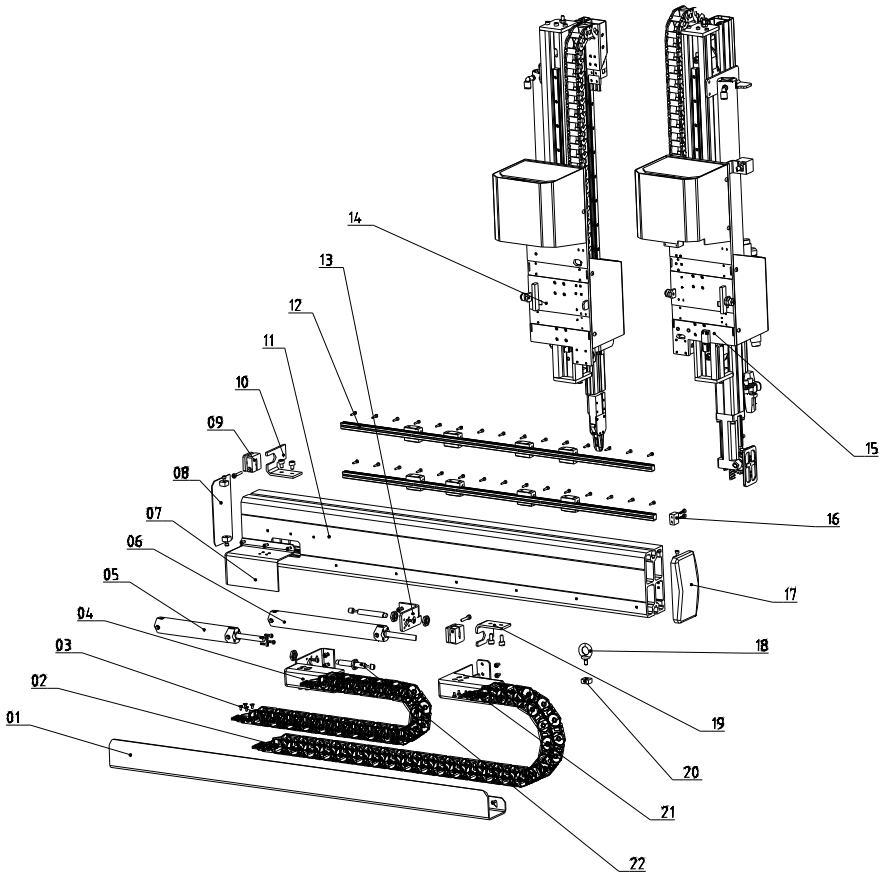
27. Proximity switch 28. Cylinder supporting frame on sub arm 29. Sensor fixing plate

30. Up-going sensor plate of main arm 31. Steel cover 2 of sub arm 32. Shock absorber

33. Mounting plate of proximity switch 34. Anti-falling cylinder

Picture 7-6

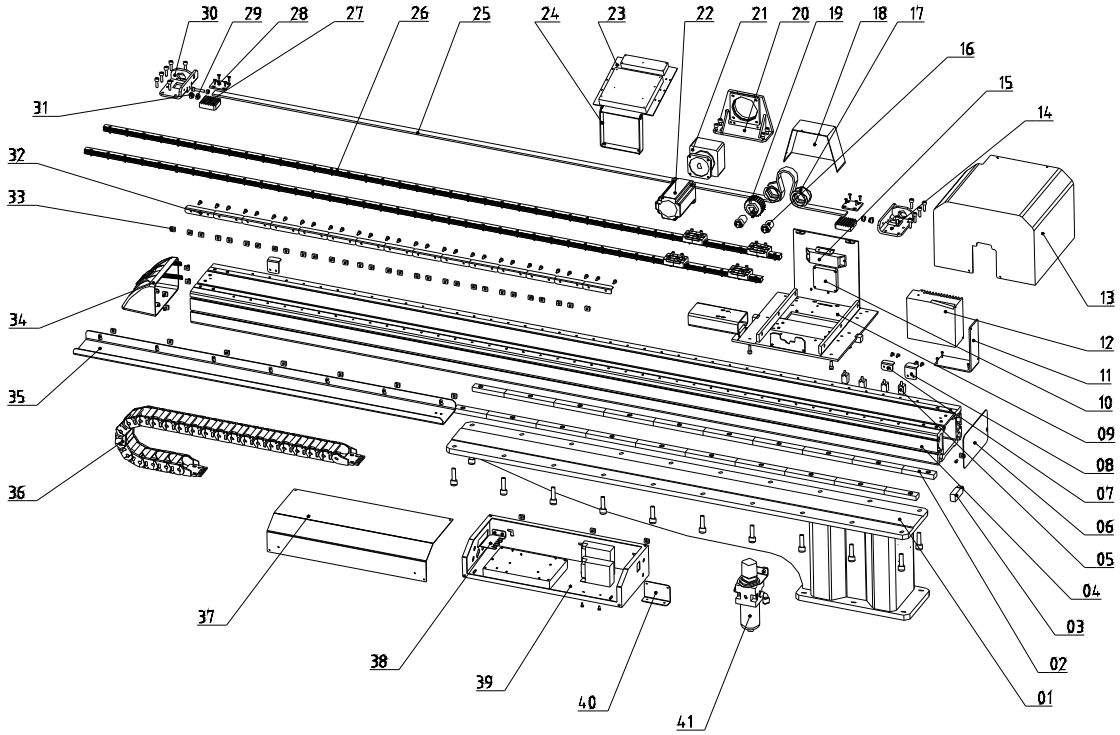
7.7 Vertical (ST1-T: Telescopic Arm)



01. Drag supporting frame on vertical
02. Drag chain of main arm
03. Vertical drag of sub-arm
04. Vertical drag frame of sub-arm
05. Vertical cylinder of sub-arm
06. Vertical cylinder of main-arm
07. Drag cover of vertical
08. Left cover of vertical arm
09. Piston rod
10. Cylinder holder frame of sub-arm
11. Aluminum profile of vertical
12. Linear guide
13. Fixing frame of vertical cylinder
14. Sub-arm
15. Main arm
16. Limit baffler
17. Right cover of vertical arm
18. Lift ring
19. Vertical cylinder holder frame of main arm
20. Fixing block
21. Vertical drag frame of main arm
22. Shock absorber

Picture 7-7

7.8 Traverse unit (ST1-T: Middle Telescopic Arm)



01. Base 02. Beams fixed block 03. Pressure switch 04. Beam

05. Proximity switch 06. Beam's end cover 07. Origin sensor plate

08. Limitation sensor plate 09. Sliding base 10. Exhaust fan 11. Driver mounting plate

12. Servo driver 13. Cover of sliding base 14. Belt fixing supporting frame 2

15. Braking resistor 16. Connection shaft 17. Pulley

18. Cover of motor supporting frame 19. Synchronous pulley 20. Motor supporting frame

21. Speed reducer 22. Servo motor 23. Transverse Terminal mounting plate

24. Transverse terminal bottom supporting frame 25. Synchronous belt 26. Linear guide

27. Belt pressing plate 28. Belt cleat connecting parts 29. Buffer cap

30. Belt fixing frame 1 31. Buffer 32. Safety mold sensor plate 33. Fixing plate

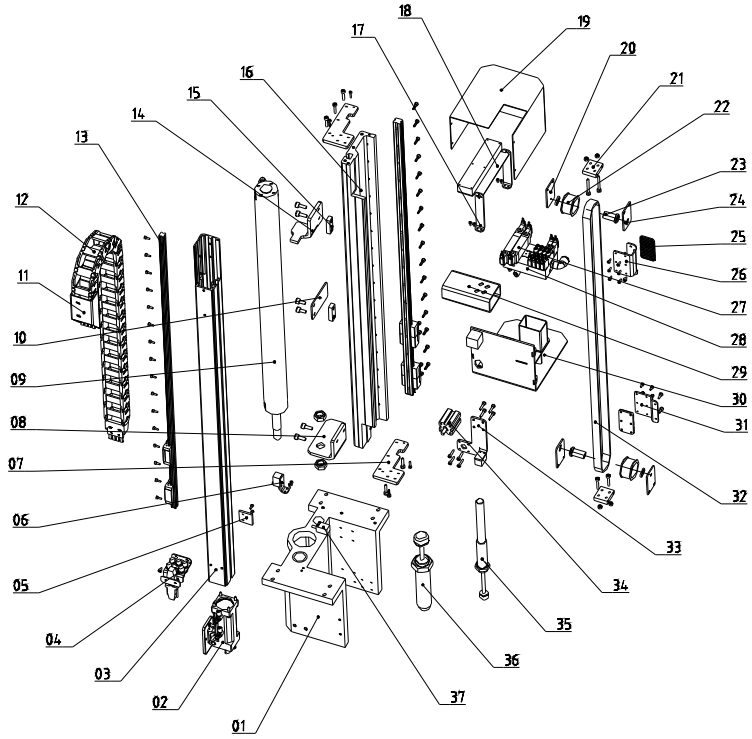
34. End cover of transverse beam 35. Traverse drag supporting frame 36. Traverse drag

37. Cover of control box 38. Connecting plate of grounded 39. Control box

40. Wave filter fixing plate 41. Filter regulating valve

Picture 7-8

7.9 Main Arm (ST1-T: Middle Telescopic Arm)



01. Main arm mounting frame 02. Rotation unit 03. Aluminum profile of main arm

04. Spare frame for air tube 05. Up-going sensor plate 06. Mounting plate of proximity switch

07. Pulley tightening plate 08. Cylinder holder frame of main arm (up/down)

09. Cylinder on main arm (up/down) 10. Arm belt fixing plate 11. Drag connector of main arm

12. Drag chain on main arm (up/down) 13. Linear guide 14. Arm down-going baffler

15. Sensor fixing plate 16. Aluminum profile of main arm

17. Terminal bottom frame on main arm 18. Terminal mounting plate of main arm

19. Steel cover of main arm 20. Pulley fixing plate 2

21. Pulley fixing plate 3 22. Pulley on telescopic arm 23. Connecting shaft of telescopic arm

24. Pulley fixing plate 1 of pulley 25. Belt pressing plate

26. Belt down-going fixing plate on main arm 27. Magnetic valve

28. Pneumatic distribution block on main arm 29. Vertical drag connector on main arm

30. Air tube connection plug on main arm 31. Main arm belt up-going fixing plate

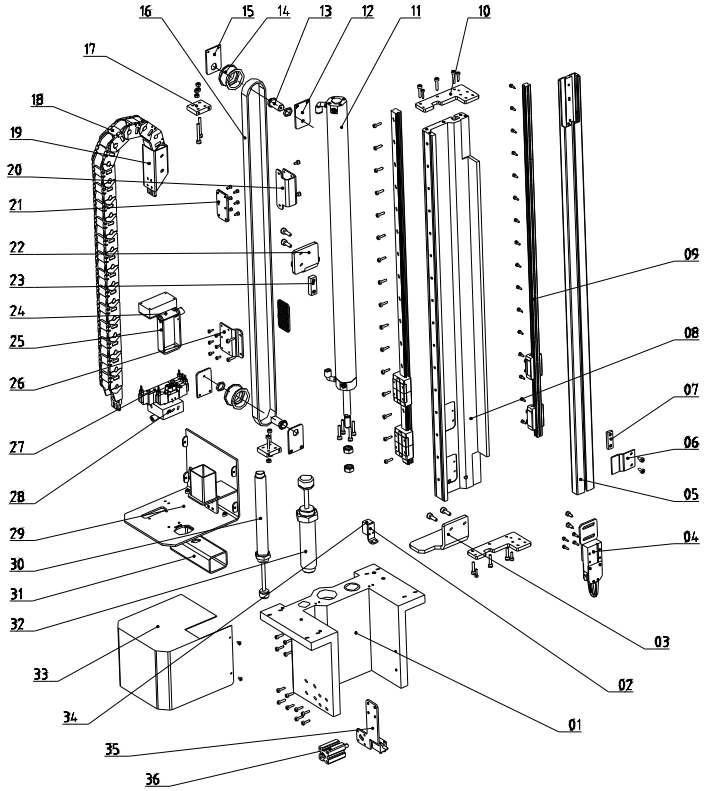
32. Synchronous belt 33. Anti-falling cylinder frame on main arm

34. Anti-falling cylinder 35. Shock absorber 1

36. Shock absorber 2 37. Proximity switch

Picture 7-9

7.10 Sub-arm (ST1-T: Middle Telescopic Arm)



01. Sub-arm mounting plate 02. Fixing plate of proximity switch

03. Cylinder (up/down) holder frame on sub arm 04. Gripper

05. Aluminum profile of sub-arm 06. Stack sensor sheet 07. Sensor fixing plate

08. Connection aluminum profile of sub-arm 09. Linear guide 10. Pulley tightening plate

11. Cylinder (up/down) on sub-arm 12. Pulley fixing plate 2

13. Connecting shaft of telescopic arm 14. Pulley on telescopic arm 15. Pulley fixing plate 1

16. Synchronous belt 17. Pulley fixing plate 3 18. Drag (up/down) on sub arm

19. Drag (up/down) connector on sub arm 20. Belt down-going fixing plate on sub arm

21. Belt pressing plate 22. Arm down-going baffler 23. Cylinder fixing plate

24. Terminal mounting plate on sub arm 25. Terminal bottom frame on sub arm

26. Belt up-going fixing plate on sub arm 27. Magnetic valve

28. Pneumatic distribution block on sub arm 29. Air tube connection plug on sub-arm

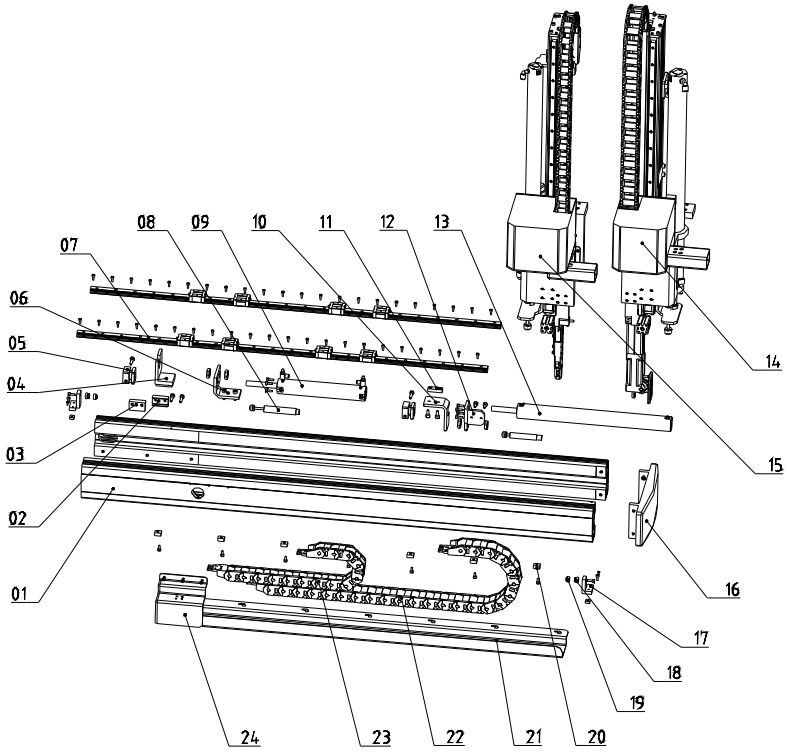
30. Shock absorber 1 31. Vertical drag connector on sub arm 32. Shock absorber 2

33. Steel cover of sub-arm 34. Proximity switch

35. Anti-falling cylinder supporting frame of sub-arm 36. Anti-falling cylinder

Picture 7-10

7.11 Crosswise Unit (ST1-T: Middle Telescopic Arm)

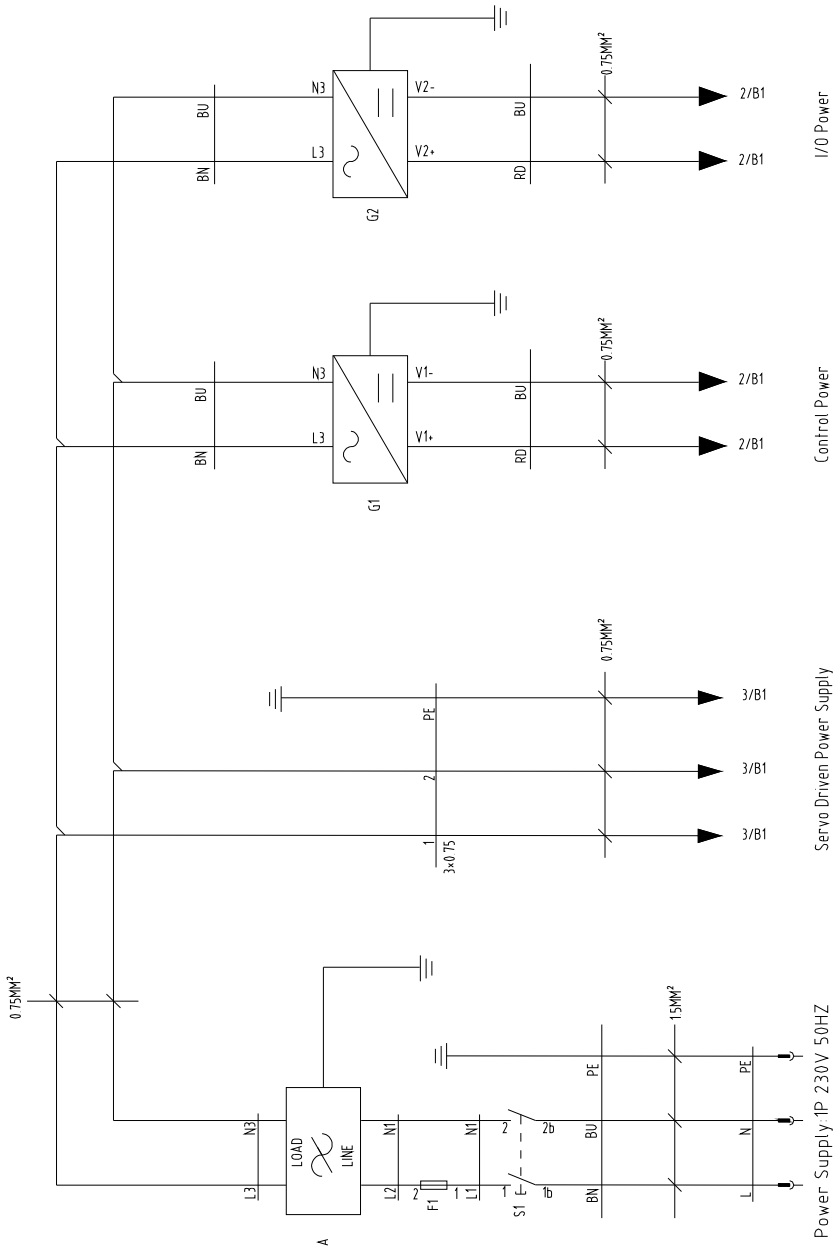


01. Crosswise beam base
02. Buffer fixing block 6
03. Buffer fixing block 5
04. Cylinder holder frame on sub-arm
05. Crosswise cylinder rod clamping device
06. Crosswise cylinder fixing frame on sub-arm
07. Linear guide
08. Shock absorber
09. Crosswise cylinder on sub-arm
10. Crosswise cylinder holder on main arm
11. Sensor fixing sheet
12. Crosswise cylinder fixing frame of main arm
13. Crosswise cylinder on main arm
14. Main arm
15. Sub arm
16. Right cover of Crosswise beam
17. Limitation baffler 3
18. Buffer installing part
19. Buffer cap
20. Crosswise drag mounting plate
21. Crosswise drag supporting frame
22. Crosswise drag on main arm
23. Crosswise drag on sub-arm
24. Cover of Crosswise

Picture 7-11

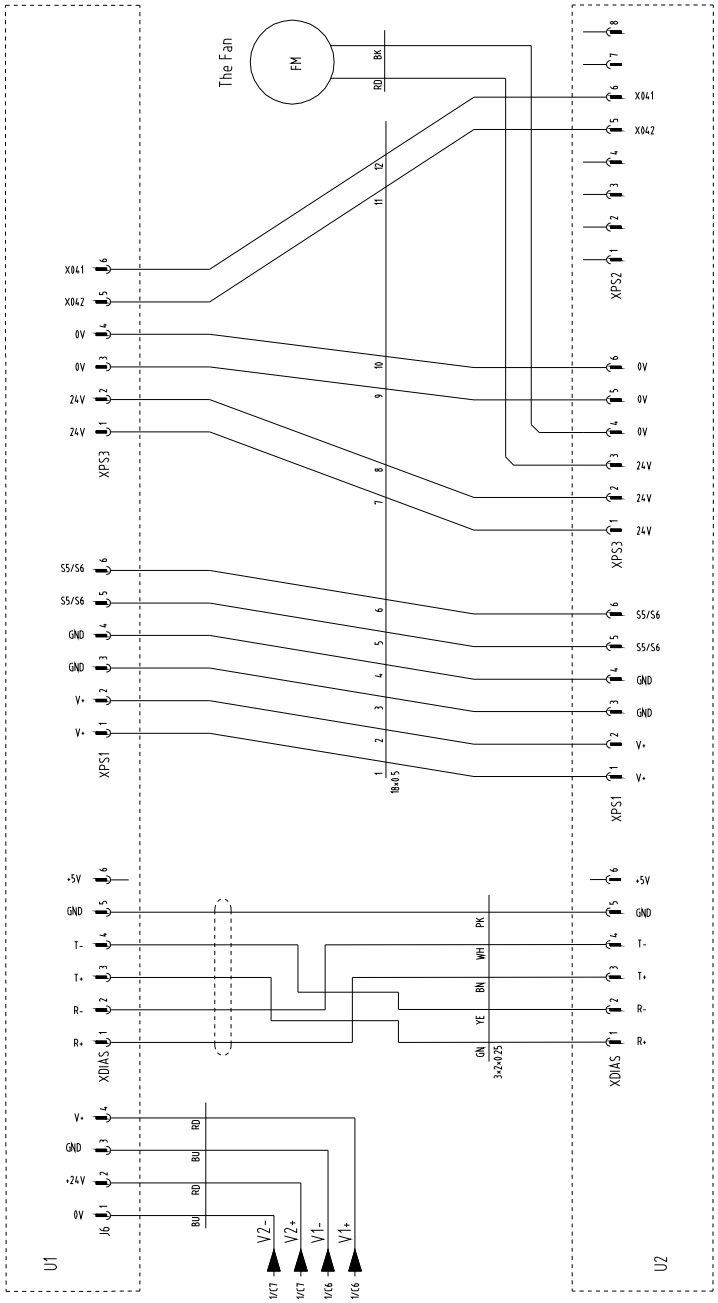
8. Electric Control Chart

8.1 The Power Input Wiring Diagram



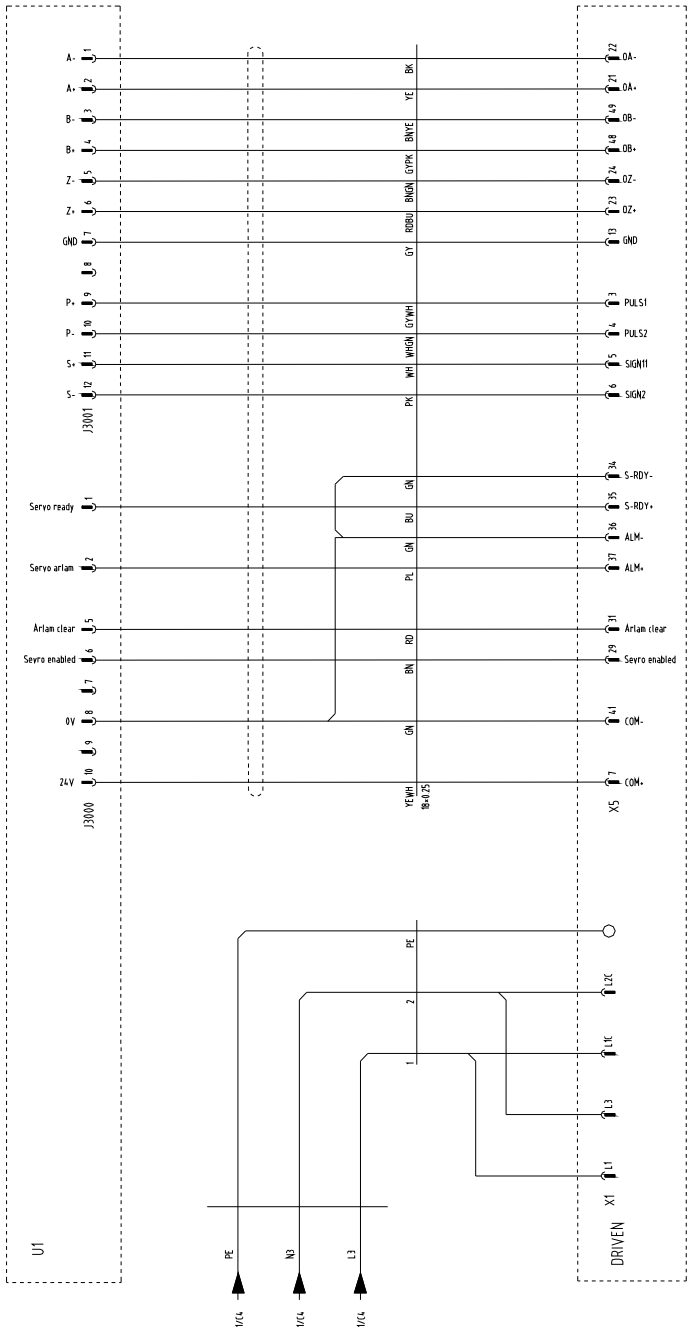
Picture 8-1

8.2 Main Control Panel and I/O Wiring Diagram



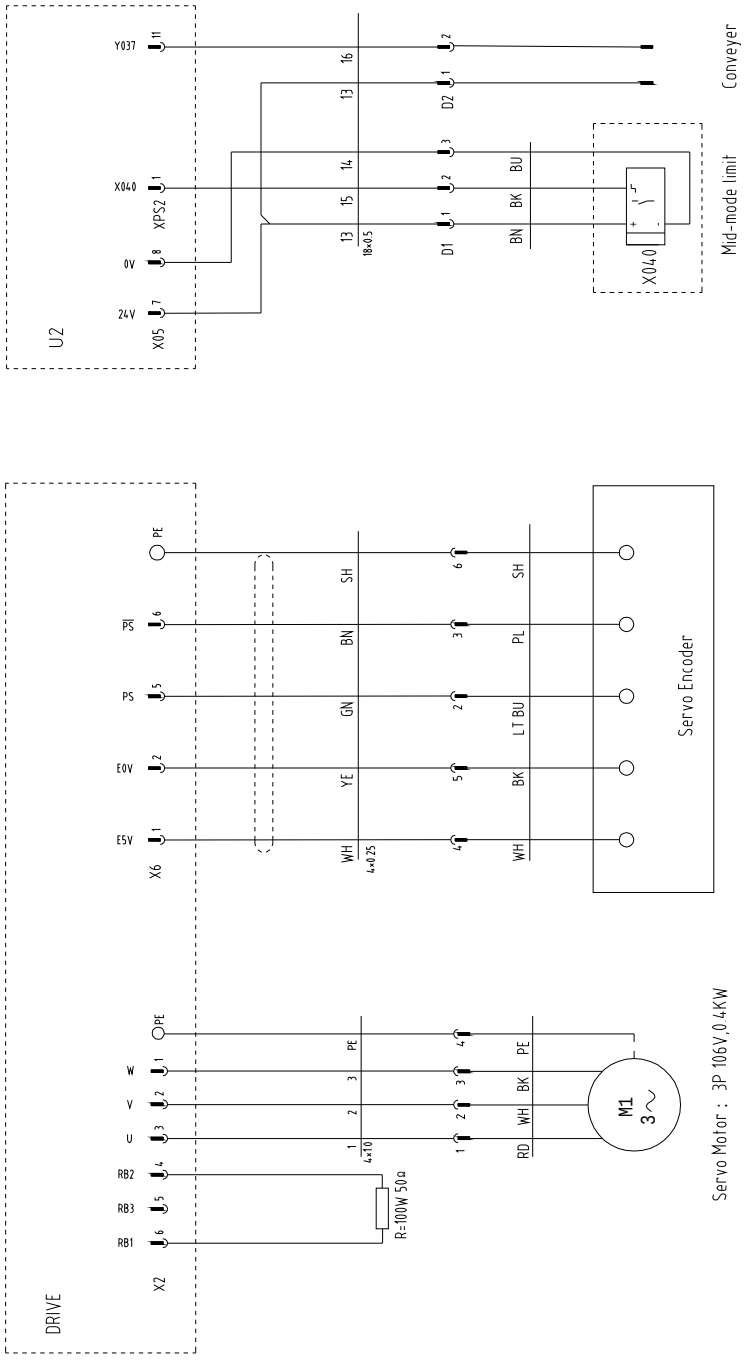
Picture 8-2

8.3 Panasonic Servo Motor Wiring Diagram 1



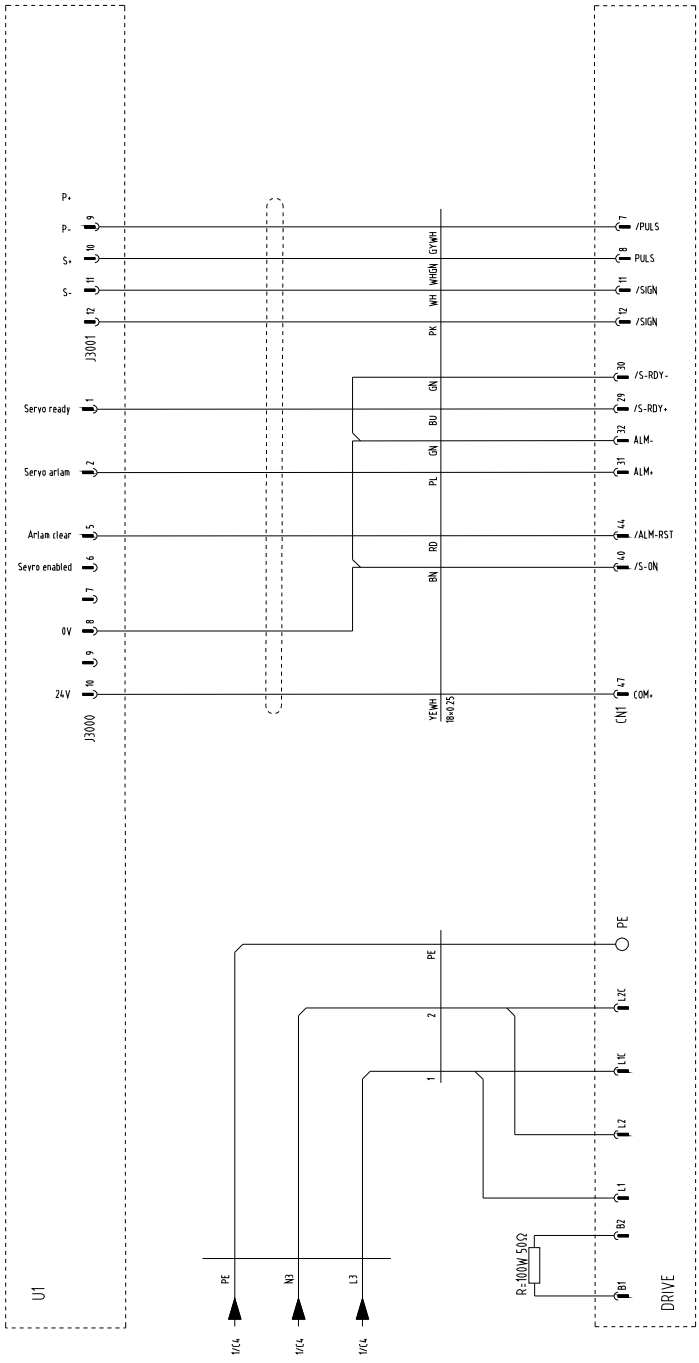
Picture 8-3

8.4 Panasonic Servo Motor Wiring Diagram and Spare Wiring Diagram



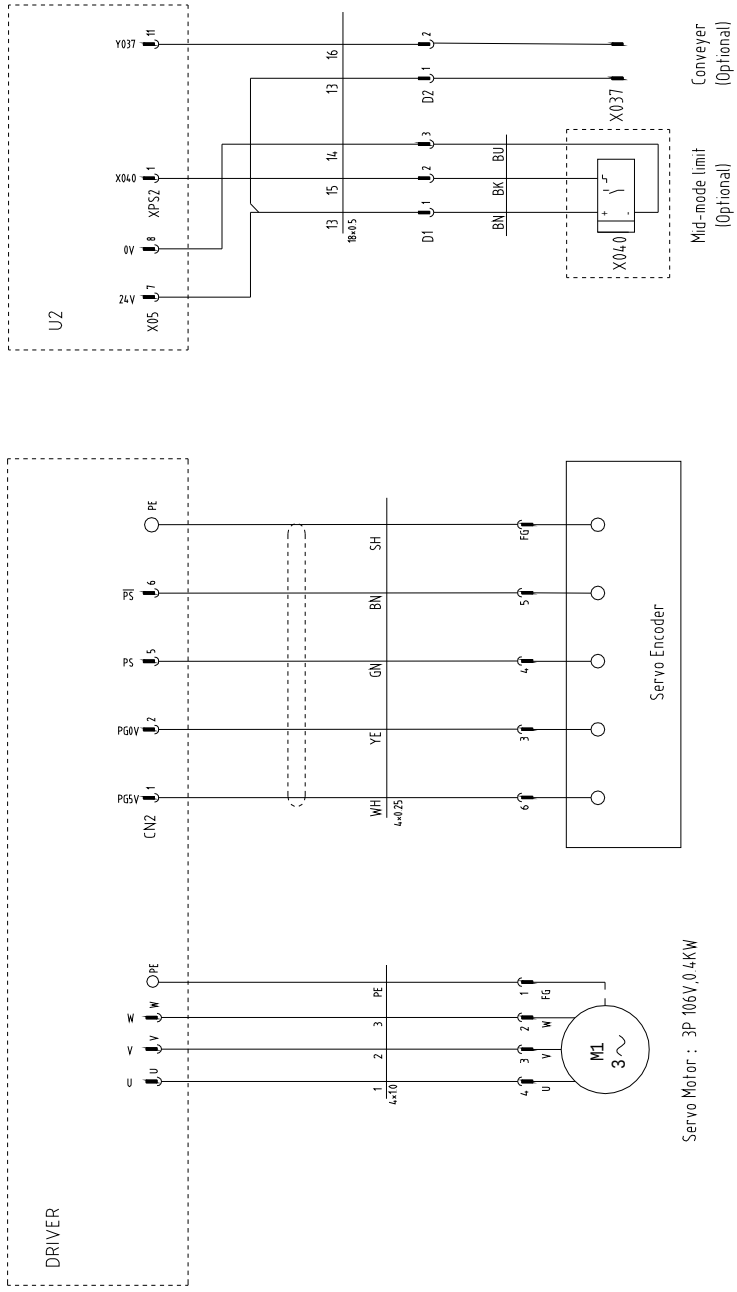
Picture 8-4

8.5 YASKAWA Servo Motor Wiring Diagram 1



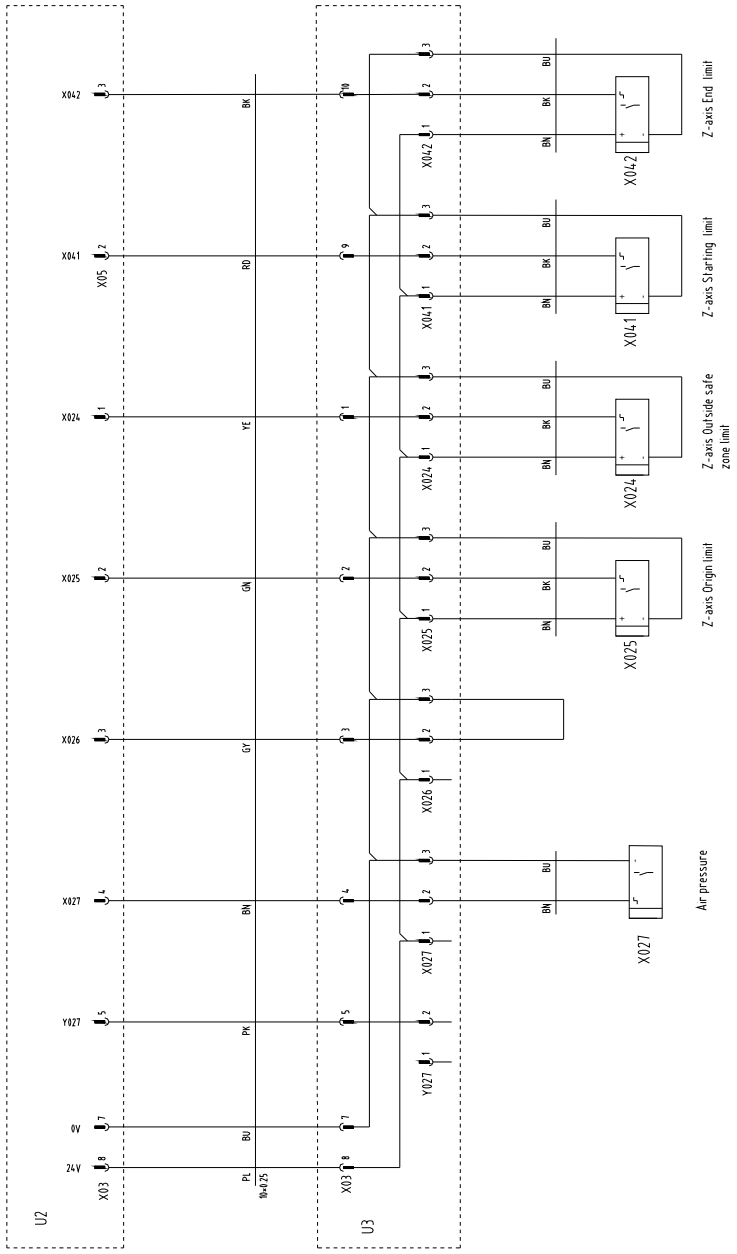
Picture 8-5

8.6 YASKAWA Servo Motor Wiring Diagram and Spare Wiring Diagram



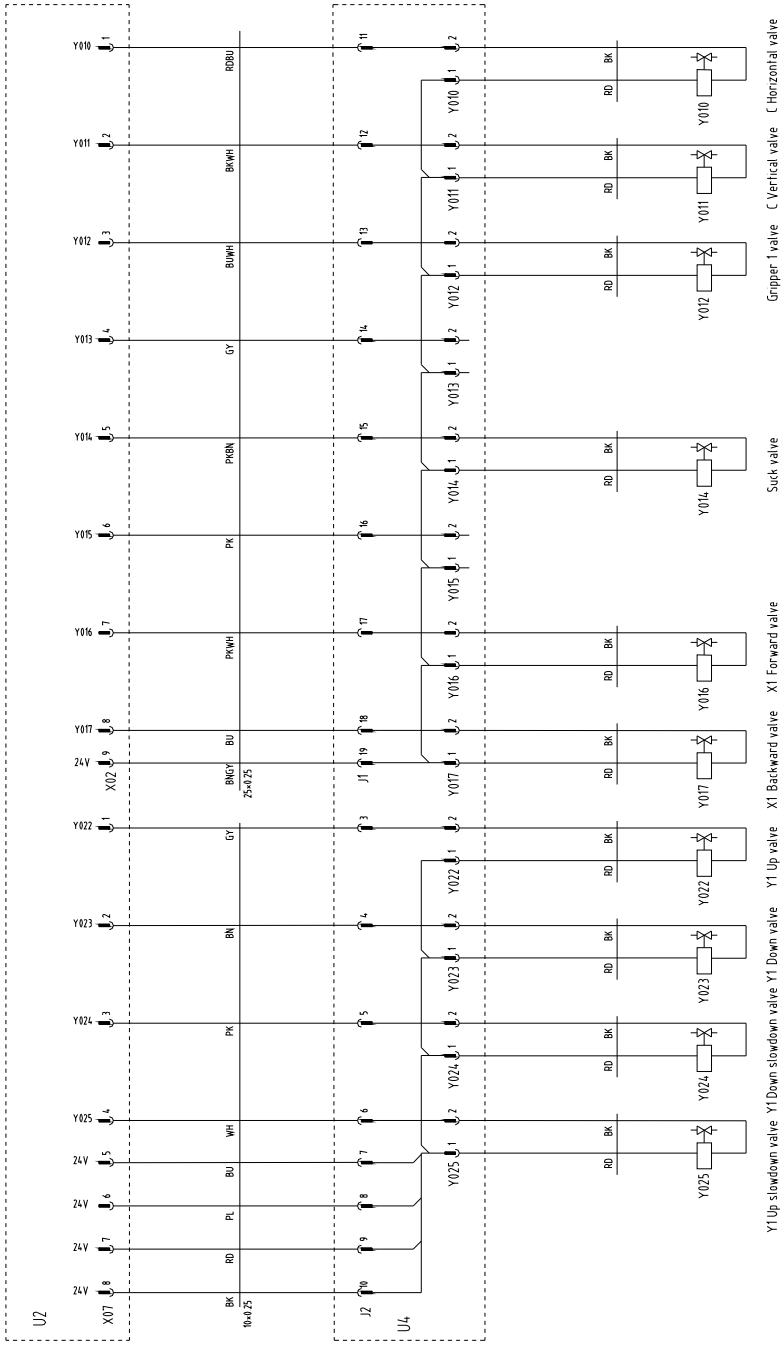
Picture 8-6

8.7 Z-axis Wiring Diagram



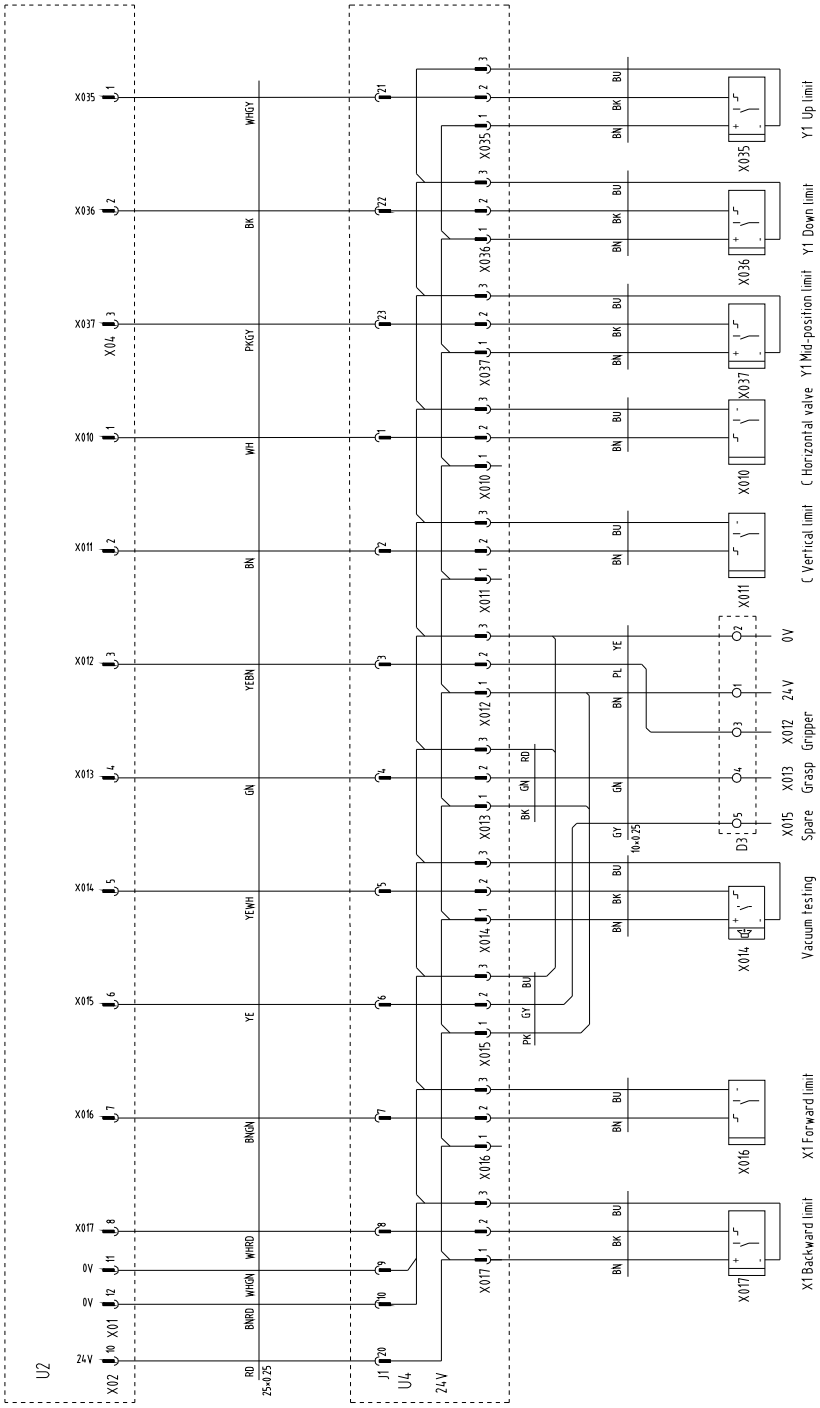
Picture 8-7

8.8 Main Arm Wiring Diagram 1



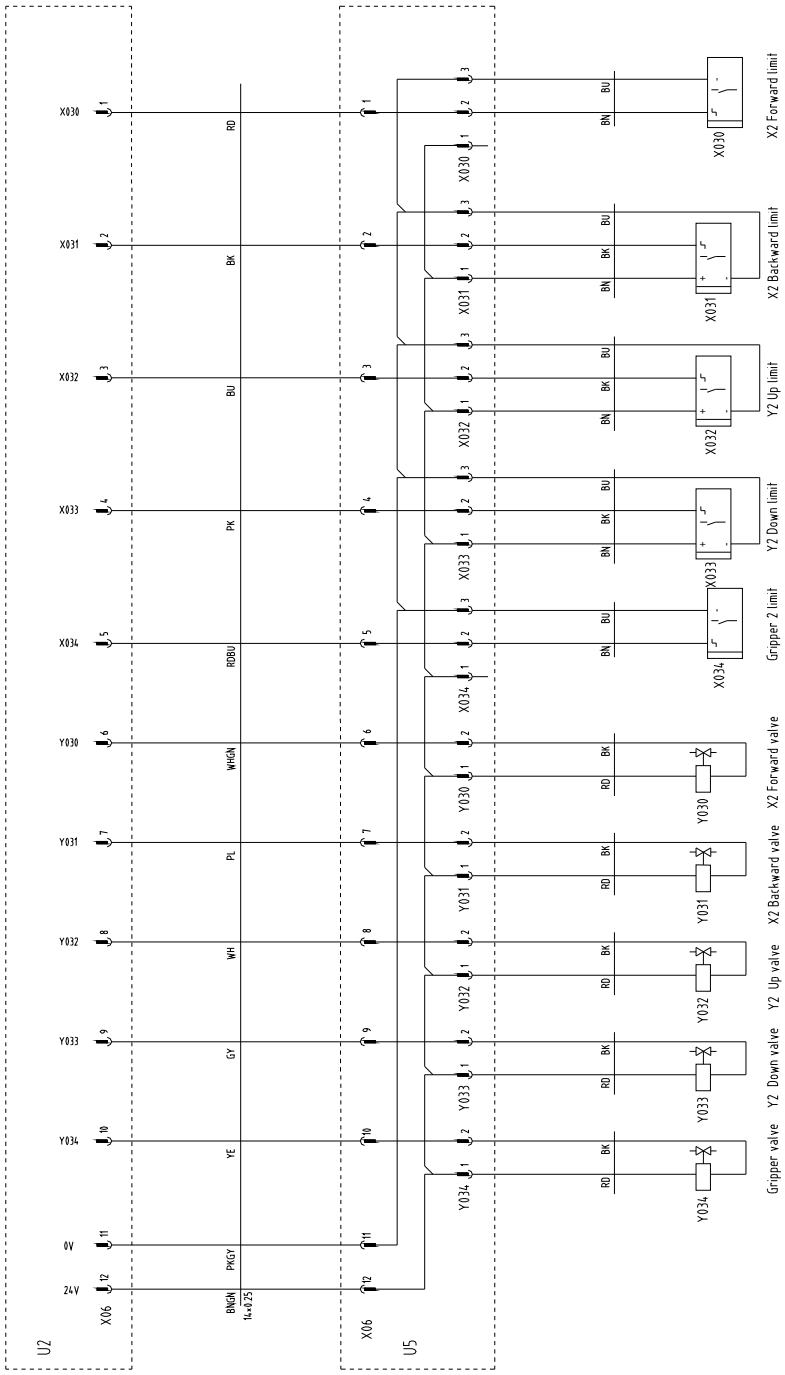
Picture 8-8

8.9 Main Arm Wiring Diagram 2



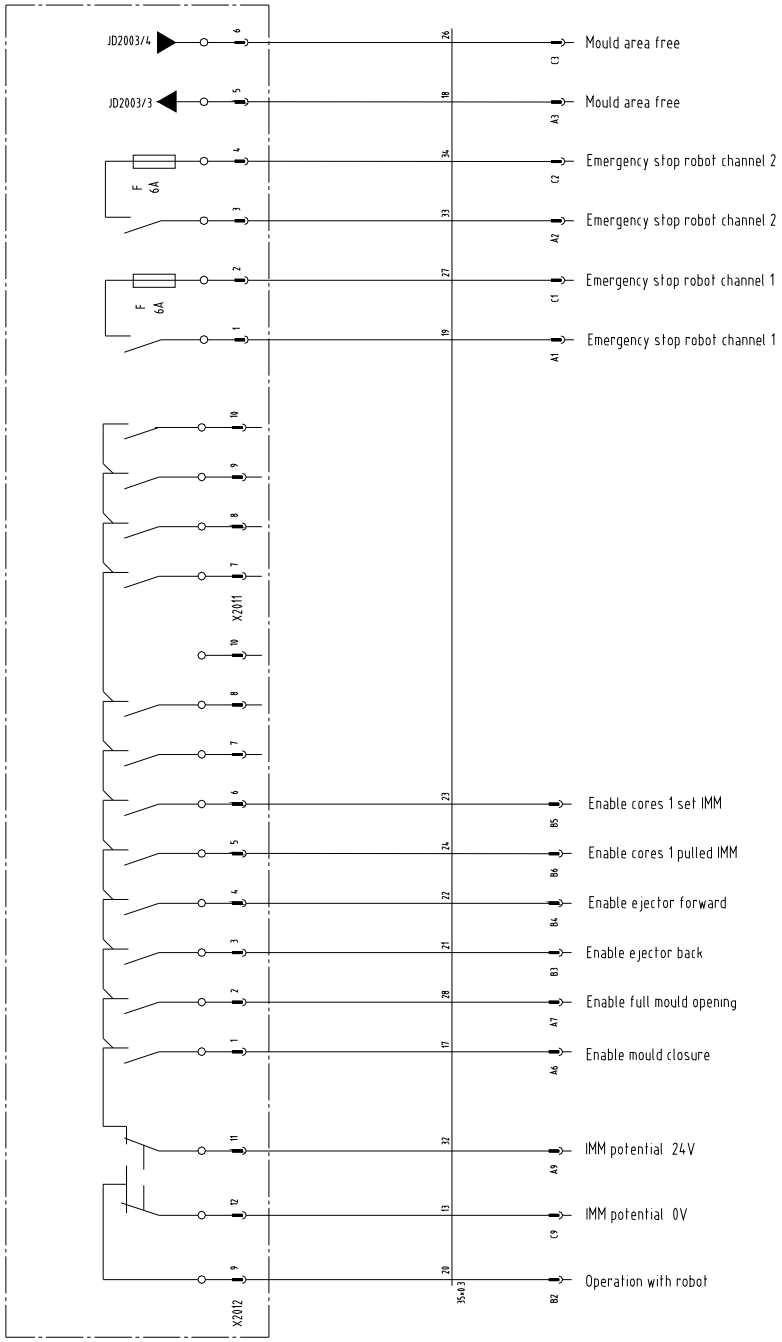
Picture 8-9

8.10 Sub Arm Wiring Diagram



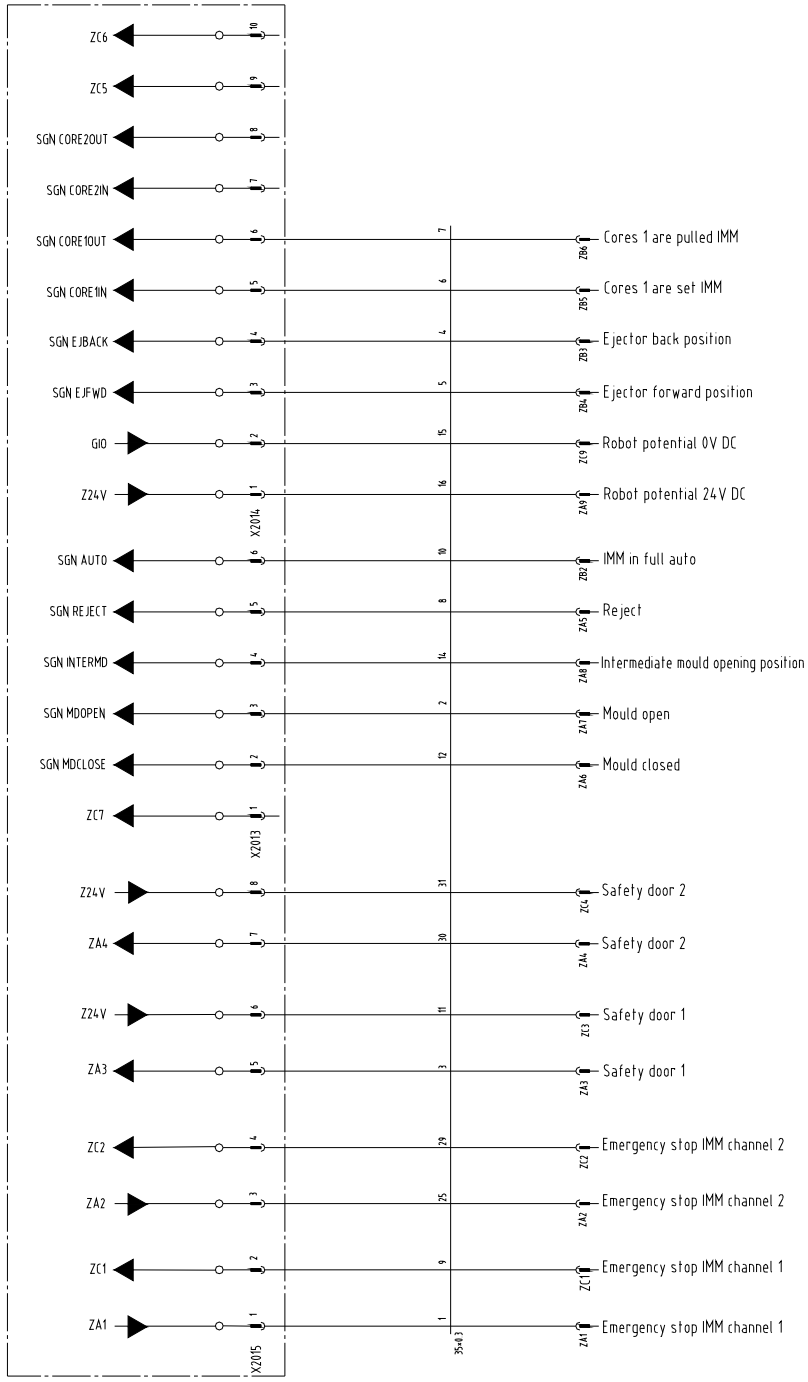
Picture 8-10

8.11 EM67 Signal Input Wiring Diagram



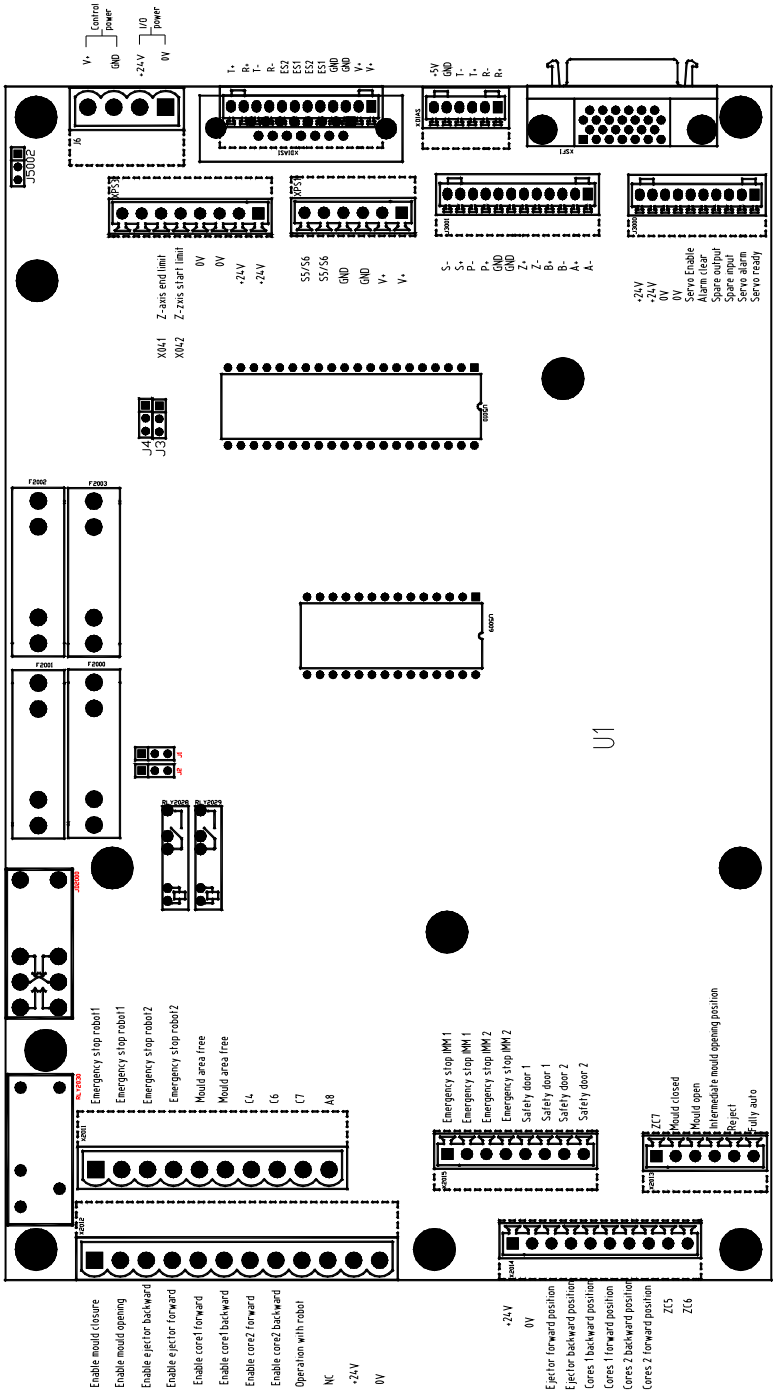
Picture 8-11

8.12 EM67 Signal Output Wiring Diagram



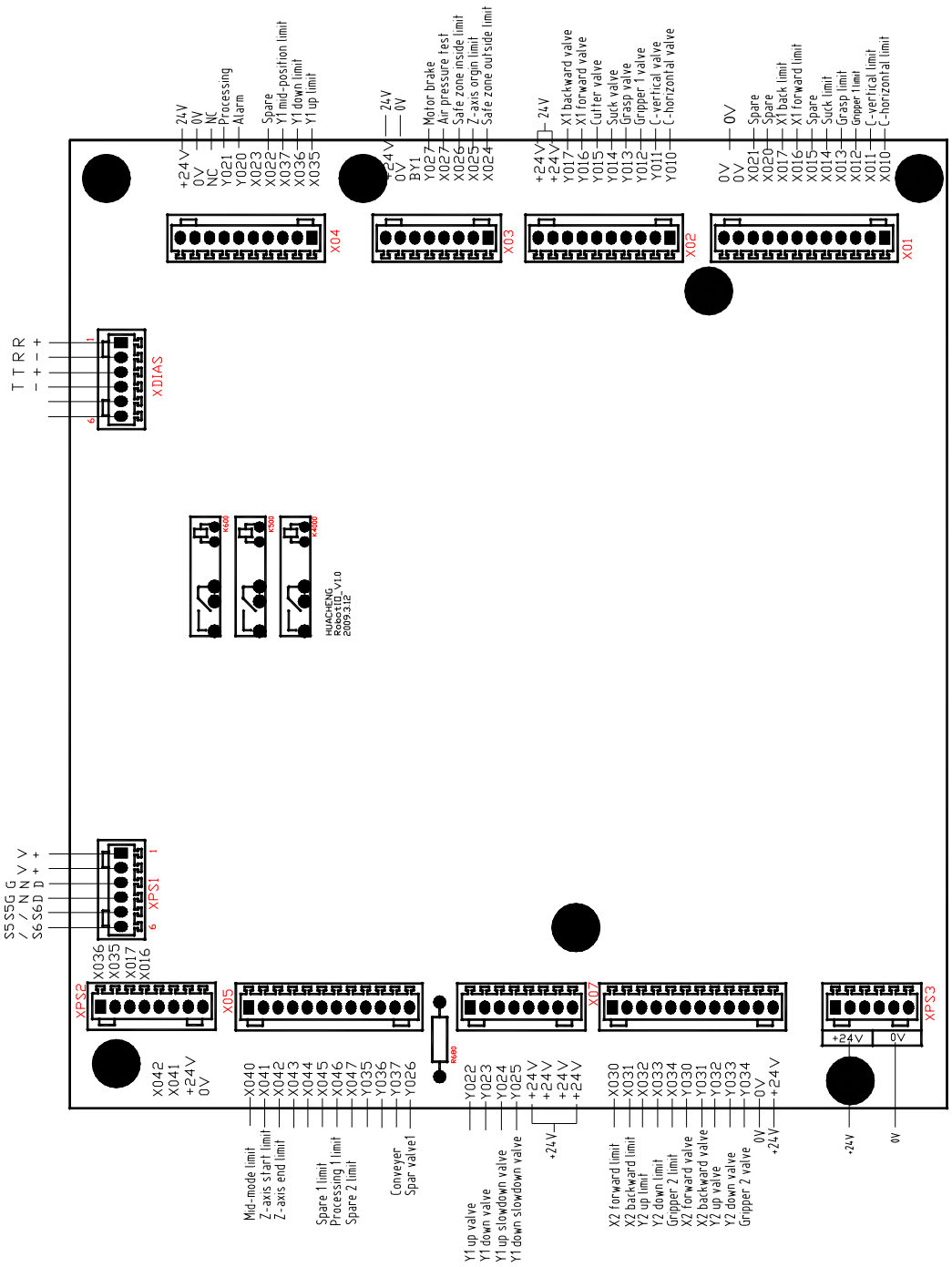
Picture 8-12

8.13 Main Control Board Component Layout



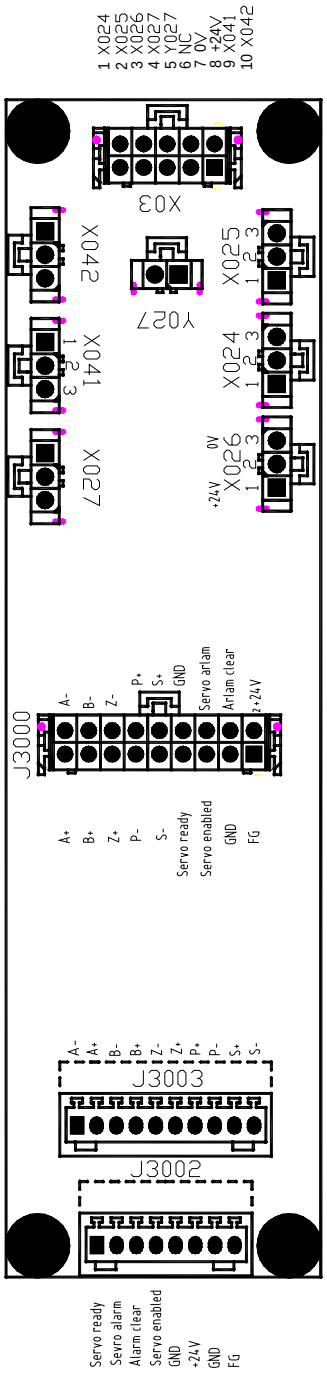
Picture 8-13

8.14 I / O (U2) Board Component Layout



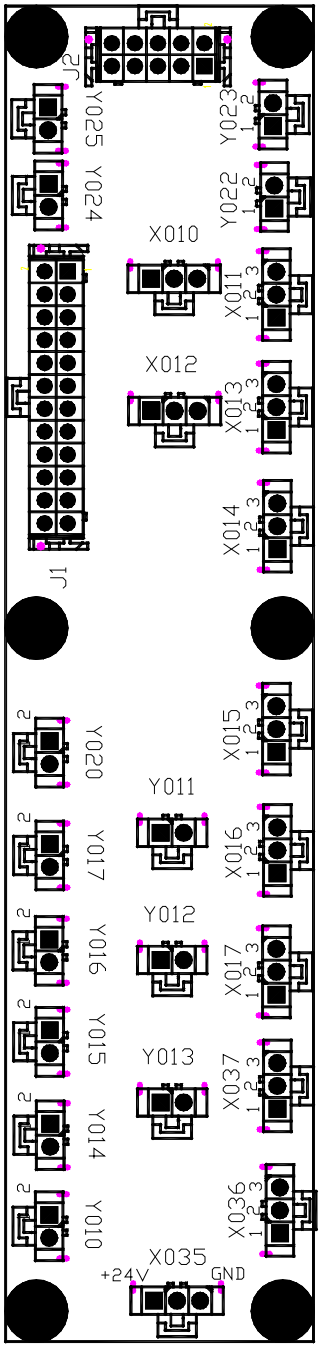
Picture 8-14

8.15 Z-axis Travel-in Board (U3) Component Layout



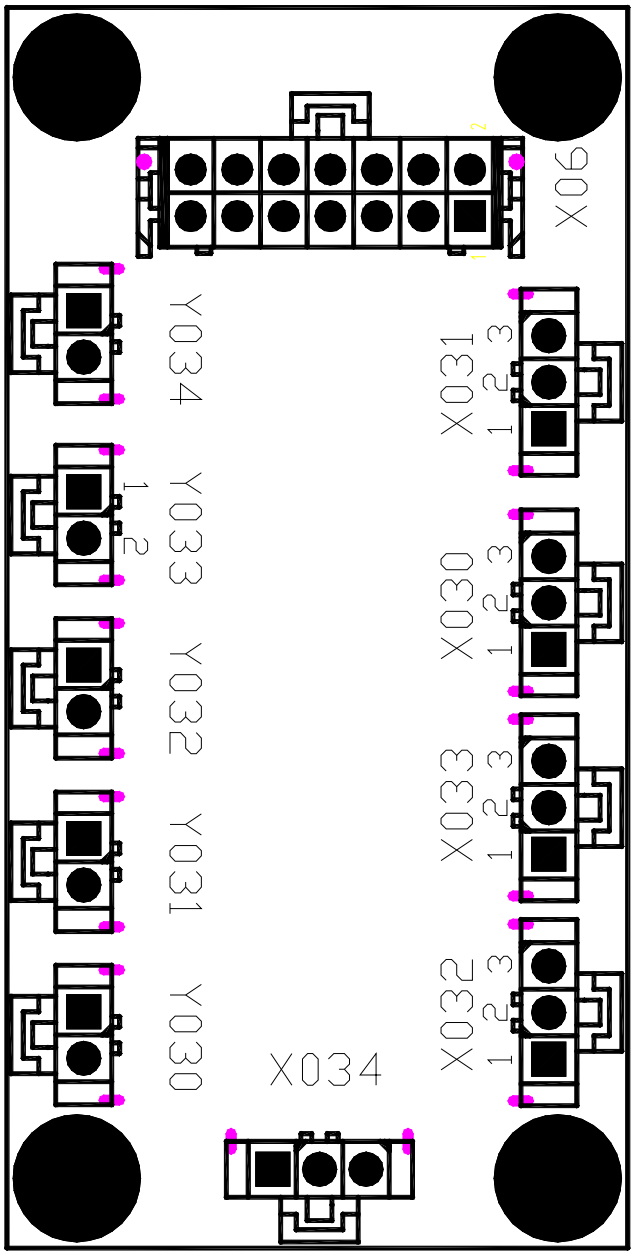
Picture 8-15

8.16 Main Arm (U4) Layout



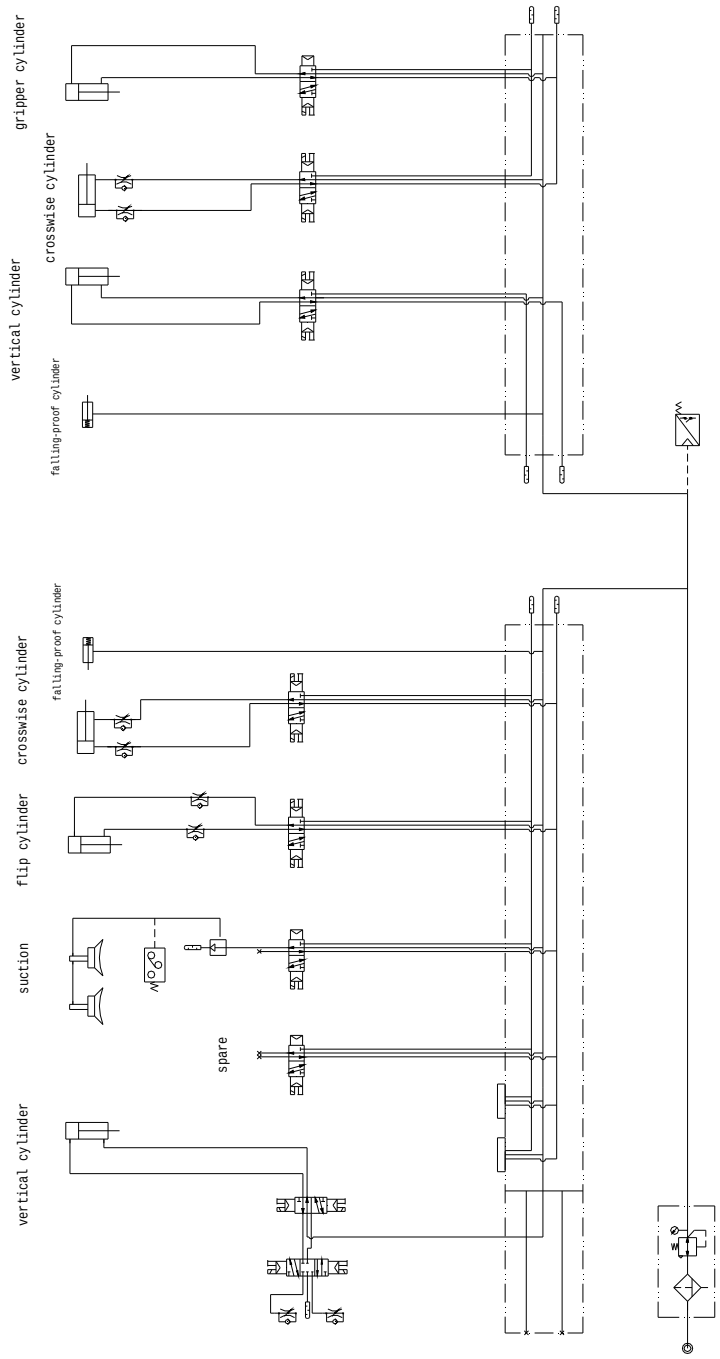
Picture 8-16

8.17 Sub-arm (U5) Component Layout



Picture 8-17

8.18 Pneumatic Schematic Diagram



Picture 8-18